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VERTICAL FARM DIVERSIFICATION

D. HOWARD DOANE

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Vertical Farm Diversification

By D. Howard Doane

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Dedicated to my Sister

EDITH DOANE BARNETT

Who in early years encouraged the boy
and in later years inspired the man

Introduction

THIS BOOK will speak effectively for itself. No person who has any interest in the advancement of agriculture will fail to find it stimulating, because it is a product of a stimulating mind.

Once in the earlier period of his active life, the author of this volume was considered as a candidate for a place on the faculty of one of the great agricultural colleges in the Midwest. When his name came before the committee, one of the members made vigorous objection to his employment: "I know this fellow Doane," he said. "If we let him come over here, he will kick up more rabbits than all the rest of us on the faculty can chase."

D. Howard Doane has been kicking up rabbits all his life. His own years, busy as they have been, have not been enough to permit him to follow all the ideas which have come to his remarkable mind. One of his talents, however, is the talent for organization. Consequently, few of his ideas have gone to waste.

The great qualities of good common sense and sound judgment are rare qualities themselves. They have never been very abundant in the human race. Nevertheless, they are commonplace in comparison with the rarity of the great quality of mental creativeness. If one were to attempt to list the names of all the men who have advanced really important ideas in agriculture during the first half of the twentieth century, and even if his list were complete, it would not be a very long compendium. D. Howard Doane has possessed and has actively been able to assess the significance of facts—old facts and new facts. He has been able to combine facts into new arrangements. He has been

able to apply these new arrangements of facts and ideas and to make them work for the improvement of agriculture. He has developed a remarkably successful business. He has unselfishly given of his time and effort for the good of agriculture and for the advancement of American society.

Early in life Doane somehow realized that managerial ability is not common. He had that capacity. Moreover, he had the ability to develop it in other persons. He fostered the theory of farm management as a real profession. As a farm manager himself, eager to assure for his new profession high standards and high ideals, he brought his followers and fellow workers in the field into what is now the very important American Society of Farm Managers and Rural Appraisers. Meanwhile, he developed the Doane Agricultural Service into an extraordinary farm-management organization which has operated farms from the Canadian North to the coast of the Gulf of Mexico. Through this service he has operated ordinary farms, large farms, great plantations, and ranches. He has managed land holdings for liquidation, but has been much more interested in operating farms for production.

He has realized clearly that there are three outstanding elements in the production of income from agricultural effort. Farm income derives from price multiplied by quantity minus cost. Knowing each of these factors to be equally important, Doane made it his task to try to determine how much skilled management could improve price, increase quantity, and reduce cost. Then he concentrated his energy and effort in whichever directions appeared to promise the most results for the least output of effort.

Doane has never been willing to accept an idea as sound merely because it was repeated by many men. In this book he sharply challenges the long-prevailing concept of diversification. He describes a new kind of diversification and gives the word a

new meaning. "Vertical diversification" is his own phrase. With it he challenges the time-honored concept that the farmer's business is merely to produce. He sees no reason why, if the farmer can take other steps, and can take them profitably, he should not do so. This book, I am sure, will further stimulate the already great interest in vertical diversification methods.

I have watched Doane and his work for nearly a quarter of a century. He has always been engaged in constructive thinking and in constructive doing. He respects facts. He not only wants all the facts that are available now, but he wants more facts to be discovered. Scientific research in agriculture, particularly in the field of chemurgy, has found in him a continuous and powerful supporter. He was one of the first men in the field of agricultural production to seize upon chemurgic ideas and to prove that they could be applied with profit.

I have written about D. Howard Doane rather than about his book. Perhaps this introduction to the man will be a better introduction to the book than I could otherwise prepare.

WHEELER McMILLEN

Acknowledgments

As THE WORK on this book progressed it became increasingly clear that the author's contribution was but a small part. Many audiences before whom I have discussed vertical farm diversification have listened, asked constructive questions, and made suggestions.

The editors of the *Farm Journal,* whose articles have been widely read—Wheeler McMillen and Carroll P. Streeter—have been extremely helpful. The contributions of Charles C. Clayton, editorial writer of the St. Louis *Globe-Democrat,* Paul W. Chapman, dean of the Georgia College of Agriculture, John J. Lacey, editor of *The Nation's Agriculture,* and J. H. Florea, editor of the *Poultry Tribune,* are acknowledged with gratitude.

In the Doane Agricultural Service, True D. Morse, president, B. G. Perkins, Ronald Colston, and others have read the manuscript and made helpful suggestions.

My secretaries, Louise Freburger and Jean Regan, have typed and retyped, read and reread, and been constructive critics and helpful contributors.

To all these, and many others who have made their experiences available and aided with suggestions and criticisms, I am deeply thankful and sincerely appreciative.

Preface

In 1927, the Doane Agricultural Service took over the management of a 7,000-acre cotton plantation in Mississippi, and I assumed direct responsibility for operations. A study of the records a few years later showed that there was materially more profit in the plantation's operations relating to the handling of the crops after they were harvested than there was in their production. Ginning the cotton, storing the seed, and co-operative selling of the lint and seed regularly returned definite profits.

Even though the yield of cotton was steadily increased, it was found that the margins in raw production were relatively small, while storing, processing, and otherwise handling the crop after it was produced represented a type of diversification that more certainly returned profits than the exclusive production of crops. In 1936, a definite program for the expansion of the processing enterprise was undertaken.

In January, 1937, I discussed the subject before the winter meeting of the American Society of Farm Managers and Rural Appraisers. It was presented under the heading of "Vertical Farm Diversification" at a meeting of the Indiana Farm Managers Association during the summer of 1938.

Early in 1943, the idea was discussed with the editors of the *Farm Journal and Farmer's Wife*. Out of this grew a series of articles which began in November, 1943, and continued for six months in that magazine. The *Farm* Journal has a circulation of over two and one-half million. In June, 1944, *The Nation's Agriculture* began the publication of a series of three articles on

the same subject. These widely circulated articles prompted demands from the United States for more information on the subject.

As a result, I have written this book to expand the idea of *vertical farm diversification* and attempt to answer many questions about it.

D. Howard Doane

St. Louis, Missouri
September 20, 1950

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Vertical Farm Diversification

1. Diversification in Agriculture

VERTICAL FARM DIVERSIFICATION is the handling of farm products by the producer for one or more steps beyond raw production. It may consist of transportation, packaging, processing, storing, or retailing by individual farmers or by co-operating groups of farmers. It starts with the completion of production and may follow through to the final consumer. The route and scope are generally indicated by the size and character of the operation. The poultry farmer may go from eggs to fried chicken, with little or no help from others, while the wheat, corn, or hog producer may find it advantageous to co-operate with his neighbors in turning grain into bread or hogs into hams.

The idea of vertical farm diversification is not new. Farmers have practiced it for many years as their way of marketing their products.

I can remember hearing my father tell of his early farming experiences, saying that he made most of his money by selling retail. His hogs went to his customers as sausage, hams, and lard; and eggs and dressed chickens were sold to the same persons. One of my first responsibilities was to

deliver milk, cream, and cottage cheese on a milk route which was the outlet for the production of a small herd of dairy cows. It was this retail price that made it possible for our family to obtain a living from the milk of a few cows. The wholesale price of $1.50 a hundredweight in bulk would not have supported us. At five cents a quart, $2.50 a hundred, the small herd made a profit, furnished part-time employment for my brother and me, and almost doubled our gross income.

Diversification is not a new term in agriculture. In the past, it has meant what we may call *horizontal diversification*. This is simply growing a greater variety of crops or perhaps handling livestock. The idea of crop diversification has been universally offered as the panacea for one-crop farming in the corn, cotton, and wheat belts. When farmers in these areas asked their advisers what could be grown that would be equally as profitable as the one crop they were growing, they got evasive answers or none at all.

Forty years ago, while I was making a survey for the United States Department of Agriculture in the northwestern wheat belt, I heard the universal answer for the problems of the area—"Too much wheat," or "One-crop farming," or "These farmers have got to diversify if they ever expect to make money and get out of debt."

A few years later, I heard the same story in the cotton belt. Volunteer advisers were saying that the trouble with the cotton belt was too much cotton. "We've got to get away from cotton." "The blessing of the boll weevil" was not an uncommon statement and a monument has been erected to do him honor. The inference was that a pest had

been sent to force the unwilling farmer to abandon the crop that, throughout the years, had been his mainstay and only source of cash income.

The idea of too much cotton seemed hard to accept, so a cross section of those who grew and handled it was asked this question: "When, if ever, did *you* have too much cotton?" The share-cropper replied: "I's ben try'n to grow more'n more cotton all my lif'. If I knowed how, I'd grow more right now. My best year was when me and my family growed and picked twenty bales." The planter said: "I was raised on a plantation. First, I helped Dad, who was a planter, but for the last twenty years I've grown cotton for myself. I never had too much. It's been the little crops, not the big ones, that have hurt me. Not until the government made me plow up cotton did I ever willfully waste one pound of it."

Every ginner wanted to handle more cotton. No railroad wanted to haul less. No compress operator wanted fewer bales for storage. Every crusher wanted more seed for his mill, and every factor wanted to buy and sell more lint.

Here was the wheat story all over again. Everyone, except those directly concerned, agreed that the way to save the cotton belt was to have less of the crop that had brought fame and fortune to it. The banker complained about too much cotton and the necessity for diversification, but refused to lend money for growing any other crop save cotton.

Just what did these advisers mean when they were telling wheat, cotton, corn, and rice farmers to diversify?

They were simply saying to them that they should grow more and more of the less and less profitable crops.

The result has been that the farmer has continued to grow wheat in the best wheat areas and cotton in the cotton belt. He has been reluctant to give up the floundering single-crop boat for a raft in the waters of multi-crop diversification.

We would never have had these specialty belts if the dominant crop had not been the most profitable. This being the case, the degree to which a farmer departed from his source of highest income represented the degree to which he passed from maximum profit to less profit. If corn stood first, then surely wheat, beans, peas, and hay represented crops with smaller margins. This the farmer knew better than anyone else. He knew it so well that he has, throughout the history of American agriculture, refused to follow the free advice he has so often received.

On the other hand, the farmer has always diversified his crops to some extent. He has recognized the necessity for balancing his labor from early spring to late fall. Oats have seldom, if ever, made as much for the corn-belt farmer as has corn, but they could be sown and harvested at a time when they conflicted but little with the corn crop. Clover did not compare with corn in profit per acre, but it played an important part in livestock farming, soil building, and increased corn yields.

Diversification of farm activities, soil conservation, and balanced labor distribution are desirable factors on all farms. They should and must be accepted for what they actually contribute, but not to the extent that they decrease

ultimate profits. Every good corn, cotton, and wheat farmer is constantly studying ways and means of producing more and more of his major high-profit crop. He not only wants higher unit yields, but more acres. In this he is right. He grows and turns more legumes for the primary purpose of producing more of his dominant crop. These secondary crops are a means to an end rather than an end in themselves. We cannot eliminate them, for they make an important contribution, although they add little to profits directly.

Railroads operate under the same principle. They accept the car of bricks at St. Louis to go to Chicago at $3.30 per hundredweight in order that they may be better prepared to obtain and haul the car of shoes at $8.60. It is not probable that a railroad could exist on exclusive low-rate materials, but they fit into the over-all scheme of full loads, low man-hour costs per ton, and balanced two-way hauls. It is this well-established principle found in varying degrees in many industries that we must employ in agriculture.

In short, the horizontal diversification that farmers have been taught and advised to follow is in many respects a necessity. It cannot be justified on the basis of its own direct merit or contribution to profits, but rather as a means for accomplishing other desirable ends, which, as yet, we have not learned how to achieve in any other way. No doubt, the time will come when we will have a minimum of crop diversification. We will ever seek to become more and more intensive specialists within the limits of sustained yields and proper soil conservation. Every well-informed

person in agriculture knows that our specialty belts are our most prosperous agricultural areas. These belts will be even more prosperous when the farmers within them learn how to grow more and more of their main crop on a sustained or ever increasing yield basis.

The important and fundamental difference between horizontal diversification and vertical diversification is that within horizontal diversification the farmer remains in a non-fixed-margin group, while in vertical diversification he joins those who must have a fixed margin—a profit margin—to exist and stay in business. The farmer, whose competitors are exclusively other farmers, finds himself selling in markets that have no fixed margins and no added profits, and these competitors bear down upon him most heavily when selling prices are lowest. When his efforts take him beyond raw production into vertical farm diversification, he notes that his competitors remain as such only so long as they make profits. When his elevator or creamery competitors cease to make money, they go out of business. This is in contrast to his neighbor who produces as many eggs at 10 cents a dozen as when he receives 60 cents. This is one of the fundamental facts behind the economic soundness of *one crop but not one process.*

Ronald Colston, one of my associates, comments and illustrates the point thus:

"Vertical Farm Diversification means putting most of the eggs in one basket and then doing something with the basket. Production has now outrun demand except in war-times. Increased mechanization, accumulated capital and increased labor have put farmers in a position to tremend-

ously increase production far beyond the needs of our domestic peace time economy. Overproduction (or under-consumption) can only result in lower prices."

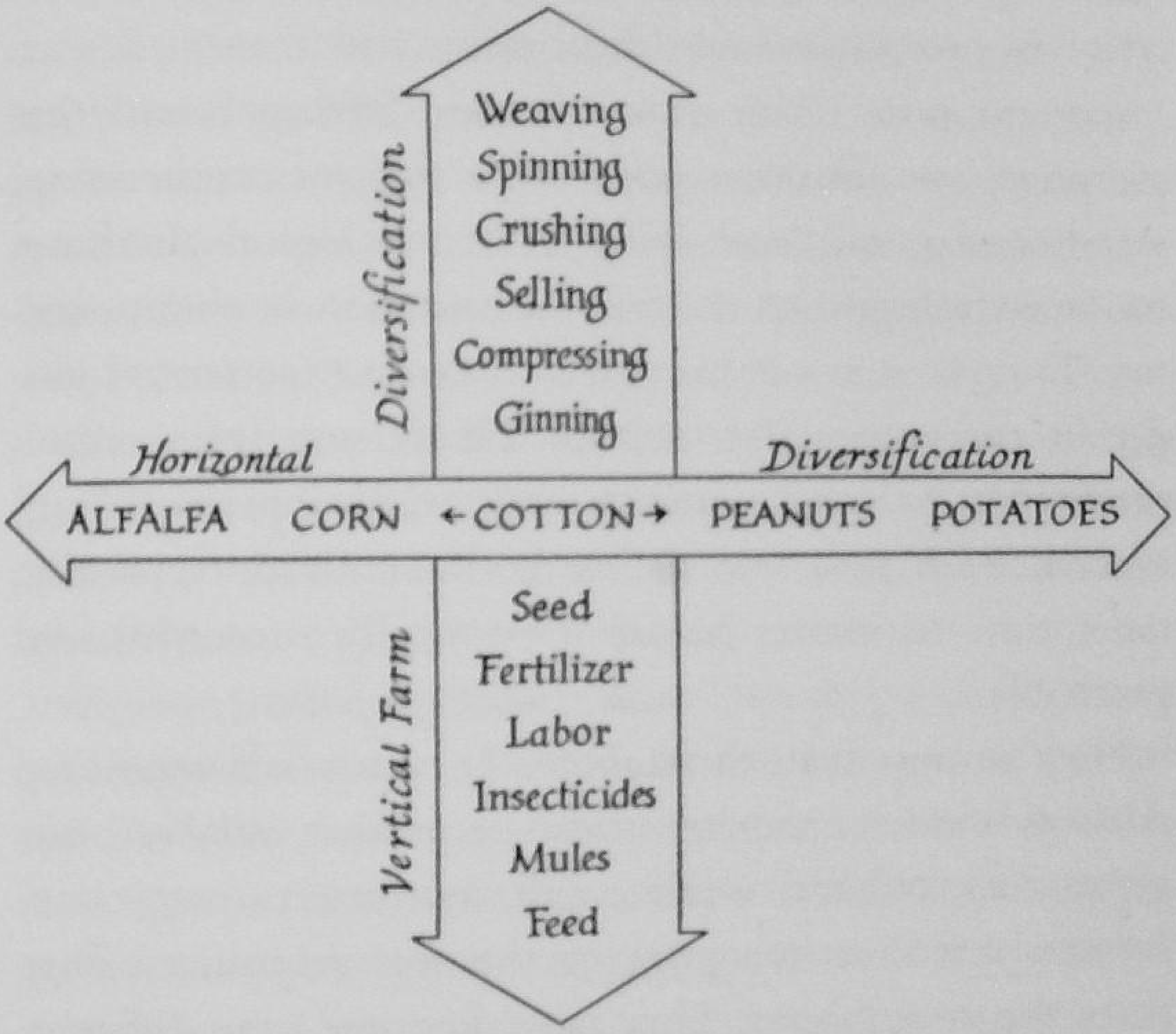


Fig. 1.

In Figure 1, horizontal diversification is shown as going across the line, in the form of a *variety* of *crops,* while vertical diversification goes up or down as a *variety* of *processes* or activities.

The thinking farmer notes that many things are done with and to his products after he normally parts with them. He asks himself whether it might not pay *him* as well to follow along with his apples after he has picked them, as

it would to spend his time growing more apples or some other crop. He notes that someone must be making money packing and processing them, else there would not be so many canning factories. This leads to a diversification of effort from production to processing and therein lies an important point. The cotton farmer, having found that ginning pays, considers other steps such as compressing, warehousing, and seed storage. This is logical thinking, for he is dealing with the crop he knows most about—cotton. True, he may not become at once an experienced ginner or compressor, but neither did he step from cotton production to corn growing with wide experience and success. Each new step, either horizontally or vertically, takes time to master before it is wholly successful and profitable.

How strange that, throughout the years, self-appointed advisers should condemn those areas that produce our greatest agricultural wealth, and continue to suggest to farmers that they stop growing the very crop that brings them the most money. They have diagnosed the difficulty as specialization of production and missed the real point entirely. It is not the one *crop* but the one *process* that has hurt. Farmers should grow more, not less, of their most profitable crops, and then diversify vertically by adding *processing* to *production*. There are good, perhaps necessary, features to some horizontal farm diversification, but certainly it has its limits in the number of different crops that should be grown. Only man's vision is the limit to vertical farm diversification. There are practical limits to population density and the number of people agriculture,

under the old concept, can support on a given area, but when agriculture grows vertically—moves up—only man's ability is the limit.

All true wealth comes from the earth. The soil produces our only renewable resources. Those who labor to produce raw products only are doomed to penury. If we, in America, are wise enough to tie essential production to intelligent processing and let the fruits of the latter flow to the producer, then our fondest dreams for American agriculture will become realities.

The next few chapters will touch upon a bit of agricultural history, showing that vertical farm diversification is historically old and marked the beginning of American agriculture.

Our agricultural colleges were founded on the theory of maximum gross production. (This early emphasis faced revision when we hit the depression years of the early nineteen thirties). Only recently was agricultural teaching concerned with marketing, management, and economics.

As we progressed, specialization came into the picture, and others took over some of the functions early American farmers performed. This left them as exclusive raw producers, the returns for which are always small.

As exclusive producers, farmers had little opportunity to study grades and market standards. As a result, practices growing up around them have often worked to the producers' disadvantage, although originally intended to aid them.

Those who are only producers of raw farm products are in an unbalanced, hazardous position. During most periods

they are at the mercy of purchasers. Their products respond most rapidly and drastically to price fluctuations.

These are fundamental considerations. They will be developed to show how profoundly agriculture has been affected by them and how important it is that we now seek another basic approach to our agricultural problems free from federal subsidies and controls. We believe that vertical farm diversification offers an answer. However, to accept it without first understanding the problems of the past is not realistic. The following chapters will attempt to lay the foundation on which the later proposals are based.

2. Vertical Farm Diversification Is Old

FROM THE BEGINNING of recorded history, there is evidence that those who gathered food and fiber from fields and forests also processed it. Primitive man fashioned huts from sticks, made clothing from leaves and blades of grass, and hung hunks of meat in the sun to dry.

In Genesis, early Biblical characters were making wine from fruits, and fibers and skins became tents and clothing.

Cato and Varro gave some excellent advice and instruction in farm practices, management, and processing, which show that even one hundred and more years B.C. the Romans were practicing vertical farm diversification. For example, this is said about making farm tools:

"Concerning the instruments of agriculture which are called mute, in which are included baskets, wine jars and such things, this may be said: Those utensils which can be produced on the farm or made by the servants should never be bought, among which are whatever may be made out of osiers, or other wood of the country, such as hampers, fruit baskets, threshing sledges, mauls and mattocks, or

whatever is made out of the fibre plants like hemp, flax, rushes, palm leaves and nettles, namely: rope, twine and mats.[1]

Here are their directions for making wine from grapes:

"In the vineyards the vintage should begin when the grape is ripe, but care must be taken with what kind of grapes and in what part of the vineyard you begin; for the early grapes and the mixed variety, which is called black, ripen sometime before the others and should be gathered first, like the fruit grown on the side of the arbustum, or of the vineyard, which is exposed to the sun. During the gathering, those grapes from which you expect to make wine should be separated from those reserved for the table; the choicer being carried to the wine press and collected in empty jars, while those reserved to eat are collected in separate baskets, transferred to little pots and stored in jars packed with marc, though some are immersed in the pond in jars daubed with pitch and some raised to a shelf in the store room.

"The stems and the skins of the grapes which have been trodden out should be put under the press so that any must left in them may be added to the supply in the vat. When this marc ceases to yield a flow, it is chopped with a knife and pressed again, and the must expressed by this final operation is hence called *circumcisitum*[2] and is kept by itself because it smacks of the knife. The marc finally re-

[1] *Roman Farm Management*, trans. by "A Virginia Farmer" [F. Harrison] (New York, The Macmillan Company, 1913), 118–19.

[2] What the French call, from the same practice, *vin de rognure.*

maining is thrown into jars, to which water is added, thus preparing a drink which is called afterwine or grape juice, and is given to the hands in the winter instead of wine."[3]

The middleman did not become a dominant factor until later, when some producers turned to tent making, preaching, and shopkeeping. However, for the most part, the producer was also the processor. As history unfolds, there is clear evidence of increasing division of labor. This was looked upon by many as wholly desirable. "It is a mark of progress," they said. "Could not one man, who devoted himself exclusively to the making of shoes, do a better job at less cost than the one who made them as a side line?" As this idea became increasingly popular, the distance between the producer and the processor lengthened. Around it "classes" formed. The tradesmen prospered and increased while the tillers of the soil became peasants and slaves.

More than three hundred years ago, a new world was discovered. Again history was repeated. Early American settlers were at once raw producers, processors, and merchandisers. They grew the corn and wheat, made the meal or flour, and baked the bread. Sheep raisers did their own shearing, scouring, carding, spinning, weaving, and garment making. The man who raised the cattle was also the butcher who sold the meat, tanned the hides, and made the shoes.

Vertical farm diversification appears as a necessity to producers in primitive agriculture. Division of labor comes

[3] *Roman Farm Management*, 164–65.

as abilities to specialize appear. No nation has ever become great that was wholly agricultural. The economic history of America is an endless record of one man after another who branched out on his own to improve an old product or make a better new one. As this process has continued, the proportion of the population engaged in agriculture has steadily decreased. In 1790 it was 90 per cent, and today it is about 20 per cent. It is probable that the next census will show fewer than 20 per cent of our population directly employed in producing raw agricultural products.

There are those who say that the best evidence of the efficiency of the American farmer is the fact that, as the number of farmers decreases, the volume of production increases. This is a significant measure of efficiency in production. The trend of increased production per worker in evidence before World War II was accelerated during the war. Fewer American farmers produced a greater volume of products from 1939 to 1948 than ever before in the history of the United States.

When that record is viewed in the light of who did the producing—many were old men, women, and children—and the equipment they used—much of it old and broken down—the potentialities for greater production per worker in the future become even greater. New machines that will cut man labor many times are now at hand. Combines, corn pickers, one-man hay balers, flame cultivators, chemical weed killers, and cotton pickers are proven tools that will be universally used. The cotton belt, the last large area in the United States to give up hand labor, has cast off its last production yoke by the assured success of the cotton picker.

Photograph by Townsend Godsey

In homes like this our forefathers laid the foundation for production and processing. This is Old Matt's cabin, made famous by Harold Bell Wright in *Shepherd of the Hills*

One machine now takes the place of sixty to seventy hand pickers. As we view the future and an ever increasing list of new tools, it is not difficult to anticipate an era of increased production with minimum man labor. If this occurs, the cityward trend of population will continue.

As more persons flock to the cities and fewer remain on farms, it is logical to ask whether we can continue to produce in sufficient abundance to feed the ever expanding mass of non-food producers. One aspect of the answer is found in average yields as compared with record yields.

In the native grass areas of southern Florida, it takes twenty acres of land to support a mature cow or steer. The latter gains about 150 to 200 pounds during a twelve-month grazing period. At the Everglades Substation of the Florida College of Agriculture, R. W. Kidder made a complete fertilizer application on the muck soils of the station, planted a well-adapted grass, and then grazed it with cattle. He obtained 1,996 pounds of gain an acre in one year.

The average corn yield of the United States was less than 30 bushels an acre during the prewar years. Over 230 bushels have been produced on one acre.

The average acre yield of potatoes in the United States from 1932 to 1941 was 116 bushels an acre. The highest official yield is 1,047 bushels an acre.

The average dairy cow produces annually a little less than 5,000 pounds of milk, or 2,500 quarts, which is about 7 quarts a day. One cow has produced 41,943.4 pounds of milk in one year or about 57 quarts a day.

Yes, the possibilities of production are great. Younger men, newer, bigger, and better machines, and more effi-

cient seed and livestock appear to solve the problem of future abundance *versus* scarcity in favor of abundance. If we can thus solve the problem of our ability to produce *enough* to eat and wear, is there still another problem that might rise up to plague us in this great land of plenty?

The world has had few areas where the people have had enough to eat and wear. However we, in the United States, feel relatively secure in an abundance for a high standard of living. How long may we expect to have enough with a steady decline in rural population? Will the time come when it will be necessary to reverse the flow of young folks from country to city? Has the over-all status of the American farmer become worse as his sons, daughters, brothers, and sisters turned toward the bright lights? Are he and the country better or worse off now that he has more acres to till and manage? If he has not suffered, will the tide turn and trouble follow what has been an advantage? When and at what point, if at all, should we endeavor to stabilize agricultural population? The boys and girls from farm families will continue to go where their talents will yield the greatest returns. Can we give them city pay for rural work? Can agriculture successfully compete with industry for the best brains and abilities among our rural youth? Should we even try to do so? Do we have, as Wheeler McMillen wrote twenty years ago, too many farmers?

Well, China, India, and Mexico represent countries whose people are chiefly concerned in wresting a living from the soil. Not only is the living standard of farmers low when most of the people are concerned with produc-

ing food, but so also is the standard of urban groups. At no time in the history of the United States has the margin between enough and starvation been so narrow as when the Pilgrims were devoting themselves exclusively to the producing of food and raiment. The states having the lowest per capita income are those that are dominantly rural. The leaders within them are generally agreed that their best future lies in the development of urban industries. Perhaps, then, we should continue to encourage the building of more and bigger cities with more industries and more services.

The opposite view is expressed by a professor of agricultural economics at one of our midwestern universities, who says that agriculture in the United States is in a steadily decaying condition. As evidence, he points to the fact of agriculture's steady desertion by the young folks who were born into it. If it were thriving, growing, and prospering, he maintains, it would follow other thriving industries, namely, attract more and more people rather than cast them out.

The opposite view is expressed by Mr. C. A. Moorman of Quincy, Illinois, who says: "Vertical farm diversification, as I see it, means the intensification of that enterprise to which the farm is best adapted. This naturally leads to processing, which, in turn, appeals to farm boys and should in the end result in keeping more of them on the farm."

I do not share the view that a shrinking agricultural population indicates decadence. The country to city flow of young folks will probably continue with profit to both groups. This will make it possible for a smaller number of

farmers to take advantage of labor-saving tools, pay good wages, and compete for the hired labor necessary for maximum efficiency.

The major problem is not one of numbers in agriculture. It is primarily a problem of equitable division of national income among all workers. The imbalance that we must correct now results in the farmers, who comprise about 20 per cent of the population, getting only 12 to 14 per cent of the national income.

We have tried controlled production, artificially higher prices, and economy of production. Is there still another way? It is hoped that on the pages which follow will be found a practical attainable answer.

3. Production Was the Basic Concept of American Agriculture

As has been pointed out in Chapter 2, the American pioneer was, of necessity, producer, processor, retailer, and consumer. He gradually began dividing duties and activities until, in a short time, the producers became exclusive producers. The production of food is always a primary consideration. The more difficult the environment and the less efficient the tools, the greater the necessity for emphasizing production, and the greater the number that will be engaged in it. While it is true that our forefathers had a virgin soil, still their handicaps were so great that the problem of "enough" was always the major problem.

In 1862, Congress passed the Morrill Act that established the land-grant colleges. This act was the result of the planning, preaching and urging of Jonathan Baldwin Turner of Jacksonville, Illinois, who is in reality the father of our agricultural colleges.[1] He pledged both Lincoln and Douglass, prior to election, to support his bill, if it passed Congress.

[1] See *The Life of Jonathan Baldwin Turner*, by his daughter, Mary Turner Carriel (Jacksonville, Ill., the author, 1911).

Early teachings of these agricultural colleges emphasized production. For the first forty to fifty years of their existence, the theme of each new college department, as it was added to the one original and single department of agriculture, was *more production*. The departments of animal husbandry, crops, horticulture, and all others were set to teach methods that would result in more pounds, bushels, or tons. When courses preventing plant and animal diseases were added, they again pointed in the direction of *more* by promoting practices that would save losses, prevent the depredations of insects, and hence result in greater yields. Only for brief moments and in limited areas have the people had enough to eat. When surpluses did occur, they were generally the result of poor or inadequate distribution, and plenty appeared only in relatively small spots.

It was out of this thinking and teaching that came the slogan, adapted from *Gulliver's Travels,* "Man's greatest benefactor is he who can make two blades of grass grow where one grew before."

The producer of high yields was and still is honored: the press proclaims his achievements, and the archives record them. Contests were started to stimulate higher and higher yields. Goals of 300 eggs from one hen, pig litters weighing a ton at six months, 100 bushels of corn from one acre, and 1,000 pounds of butterfat from one cow were all marks of great distinction. If, as a result of the attainment of such honors, the breeding capacity of the cow was ruined or the fertility of the soil seriously impaired, little concern was felt. More—just more—was the big goal. All this must be kept in mind when viewing suggestions for a new point

of emphasis in agriculture. Over one hundred years of practice and eighty years of nationwide teaching cannot be quickly changed. Broad movements and changes in agriculture are slow. From concept to general practice takes from one to two generations. Even the commercial adoption of a new crop requires as a minimum eight to twelve years.

The United States Department of Agriculture established the Office of Farm Management within the Bureau of Plant Industry in 1904 with W. J. Spillman, who is recognized as the father of farm management in the United States, in charge. I began work under Mr. Spillman in 1906. Later a number of agricultural colleges began teaching farm management.[2] Marketing, rural economics, banking, transportation, and distribution were other subjects that had their influence in changing student and farmer thinking and practice from one of exclusive production to correlation, organization, marketing, and administration.

This field of teaching and commercial practice has grown tremendously during the short years of its existence. Departments of farm managment have given way to divisions of rural economics in our agricultural colleges, within which there are many correlated subjects that touch only lightly on production. One practical application of this

[2] "In 1910 the Curators of the University of Missouri, the official governing board, authorized the establishment of the Department of Farm Management in the College of Agriculture. This was the first officially established farm management department in any agricultural college in the United States. D. Howard Doane was placed in charge."—Frederick B. Mumford, *The History of the Missouri College of Agriculture* (Columbia, Mo., 1944), 118.

teaching is seen in the growth and development of farmers' co-operatives. They are now billion-dollar organizations handling the sale of farmer-produced crops and stock as well as much that farmers buy. This field received a tremendous boost in 1930 when the first signs of surpluses appeared. "Why produce if we cannot sell?" was the common expression of the time.

One of the answers to that question was "Cut down on production until consumption catches up with production." Out of this came A.A.A., the Agricultural Adjustment Act. Now the man who grew two blades of grass where one grew before must plow it under, or suffer a fine or go to jail. What had been prosperity through plenty became success through scarcity. With this theory we have not yet finished. Its proclaimers and disciples still sit in high places although the war has plowed under the surpluses of the thirties. Starving Europeans and Asiatics are ever crying for more. Prices of agricultural products are remunerative, but still we have farm subsidies, boards who tell us what we can or cannot plant, and much talk of a new farm program.

A third major step in agricultural-college teaching was conservation. It is the reverse of the idea emphasized during the first eighty years of the existence of the agricultural colleges. The effects of soil erosion were first measured and factually set forth by Dean Emeritus M. F. Miller when he established, at the University of Missouri, his soil-erosion plots in 1917. Hugh Bennett, head of the soil-conservation work in the United States Department of Agriculture, has been, and still is, an ardent proclaimer of the

necessity for soil conservation. National and state legislation, together with large appropriations, have furthered this movement. Its final niche in American agriculture is not yet established. Our forefathers set the pattern of their agriculture as a result of grim necessity. After World War I, another and even more intensive pattern grew out of a desperate fight to save farms and homes from loss and foreclosure. Business builds reserves out of profits. Farmers can build theirs only from the same source. If we can have a profitable American agriculture, we can bank some of the profits in the soil. If and when current profits disappear, we will again, as we have in the past, slow up or stop the creation of soil reserves, drain down those already established, and dig deeper into those Nature placed at our disposal. Good farming looks ever to greater yields, preserving what we have and endeavoring to build up deficiencies. Conservation will be most widely practiced during periods of agricultural prosperity.

The fourth major emphasis in agricultural education relates to the processing of raw farm products. Some work has been done in this field at a few of our colleges, and Rutgers University has just recently established a department of food technology. Other agricultural colleges are considering ways and means for more work along the same line. Out of all this preparation will grow new uses, better products, lower costs, and wider distribution. The "Ever Normal Refrigerator" so eloquently presented by the late H. E. Babcock, that pioneer thinker of Ithaca, New York, is one more facet in this same subject. A close associate is farm chemurgy. Christy Borth presented its case

in his book, *Pioneers of Plenty,*[3] in 1939. Wheeler McMillen's new book, *New Riches from the Soil,*[4] stimulates our thinking, opens new vistas, and clinches arguments with facts.

Farmers are not unmindful of the fact that their successful future lies in a different and broader view than they have had in the past of their true place in the American economy. Just what it shall be or how it will work may not be clear, but it is clear that they have tried other ways which helped in their day but plainly do not give the final answer for today.

We may summarize the manner in which farmers have tried to practice these four major steps in agricultural teaching and legislation as follows:

1. *Abundant Production*

We have seen how, from the time of the first settlers to early in the present century, farmers were taught and firmly believed that success was measured in abundant production. This idea was carried to the point where the loss of soil resources became so serious that national legislation was enacted to correct it. If further evidence is needed, agricultural history from 1930 to 1935 should provide it.

2. *High Prices*

Naturally, farmers strive for high prices. They know that the level of agricultural prices is the most accurate barometer of their financial well-being. The politician or farm leader who preaches the gospel of high prices for farm products is surest of a farmer following. The farmer

[3] Indianapolis, The Bobbs-Merril Company, 1939, 1942.
[4] New York, D. Van Nostrand Company, Inc., 1946.

does not set the price on his products but offers them to others for the prices they set. His inability to set them is one of the factors which influence him in wanting to have them high. His net income has, in the past, been best when prices were up, even though volume was down. Large crops at low prices generally return less than small ones at high prices.

Out of this thinking has grown the parity concept. It is a device for holding the buying power of farm products in line with the things farmers have to buy. During periods of price recession it tends to raise or at least hold up farm prices. Now farmers are beginning to wonder if the high-price route is the right one. Without developing the whole theory or attempting to prove it through a long list of pros and cons, let us take one example. Through the operations of parity and government loans, cotton was, during much of 1946 to 1948, selling for 25 to 30 cents a pound. Will cotton farmers in the long run be benefited or hurt if this price is indefinitely maintained? Those who think ahead see the danger. It means the loss or impairment of the foreign market and opening wide the gate for competitive fibers such as rayon, nylon, casein, and many other synthetics. Nothing would please competitors more than a permanent price of 25 cents a pound for cotton.

If American farmers wish to produce in unrestricted volume, then they must work toward lower costs and ultimately lower prices.

3. *Scarcity*

We need not again discuss the farmers' efforts to reach

fair and comparable economic levels by reducing production, other than to point them out as just one more method they have tried. It is a hard route to travel, both in theory and in practice. It controverts American agricultural history and most of our teaching. The farmer never feels quite so secure as when his bins, cribs, and mows are full. Of all routes most difficult for the independent farmer to follow, the one which indicates *less* volume will be the most distasteful, the most difficult, and in the end most certain to fail.

4. *Economy of Production*

When the tractor brought additional power to agriculture—an industry which uses tremendous volumes of power—a new era of more economical production began. Labor-saving equipment was coming on the market at an unprecedented rate when World War II brought manufacturing to a temporary halt. Now it is on the march again. The one-man baler, the combine, corn picker, and finally the cotton picker are here as proven tools for the saving of the muscles of man and beast.

Man Has Shifted the Power Load

Per cent of power furnished by	1850	1948
Man	15	4
Animals	79	4
Machines	6	92

These, together with an increasing use of functional buildings and other labor-saving methods and devices, are now saving and will in the future save a large part of the cost of producing farm crops and products. In twenty years, the

man-hours required to produce units of major crops have dropped as shown in Table I below.

TABLE I

Number of hours of man-labor required to produce an acre of crops now as compared with twenty years ago:

Operation	*Required Man-hours per Unit*	
	Formerly	*Today*
Corn per acre	18.5	6.35[1]
Wheat per acre	19.4	4.9 [1]
Oats per acre	18.0	2.93[1]
Soybeans per acre	13.4	3.76[1]
Cotton per bale	150 to 190	25 to 50[2]

1 *Illinois Farm Economics*, No. 125 (October, 1945), 275. Data for 1944 production.

2 *Changes in Farming in War and Peace, U.S.D.A. Bulletin F.M.* 58 (June, 1946).

The fundamental and historical difficulty with the low-cost-of-production theory is that up to this time the farmer has found no way of holding for himself the economies he has attained. Industry can lower production costs and determine how these savings shall be divided among the processor, investor, and consumer; but, as a whole, agriculture has not solved this problem. Except for war periods, almost every saving made by agriculture in the cost of production has gone to others. Farmers have not given up trying to lower costs. They will always buy modern machines at new high levels as soon as they become available. This new field and farmstead equipment will make significant contributions toward lowering unit costs of crops, stock, and stock products. If the farmers are successful in holding their savings, they will write a new chapter in agri-

cultural history. It is now clear that this route will be traveled once again and given a fair and exhaustive trial in the post–World War II period.

Few feel that American agriculture has found the pattern for its successful future. Our teaching concepts have expanded to include four major fields. Farm programs, some informal and unorganized and others made into national laws, cover an equal number of endeavors. Evidence accumulates that a fifth concept of teaching and farm practice is appearing on the horizon. Will it, when it reaches full noon, have the answer? Perhaps there is no final answer. The best we may hope to do is make a suggestion—just for today. It is in that spirit that these pages are written. We step back to the pattern set by our forefathers. They produced and they processed. They retained the fruits of both endeavors. The best evidence that this may be an answer is found in the actual experiences of those who have tried and are now practicing vertical farm diversification.

Here is one illustration of how it works:

Eight years ago, grape growers around North East, Pennsylvania, were "flat broke."[5]

Some were hauling wood and coal in winter to buy fertilizer and insecticide for another hopeless try "next year." Others, giving up entirely, had deserted their farms for factory jobs in nearby Erie or Buffalo. Fresh grapes sold for $13 a ton; it cost $16 to raise them.

But things are different now around North East. The reason? North East farmers went in for *vertical diversification*—the processing of their own product.

[5] An unpublished story from the files of the *Farm Journal*.

As mere producers of grapes—at the mercy of an uncertain, failing fresh-fruit market—they went broke. But when they began to collect the processing profit that they had formerly let somebody else take, they prospered.

They became processors through their old marketing organization, the Keystone Co-operative Grape Association. Started in 1925 as a fresh-fruit marketing organization, the co-op steadily lost ground.

Some members favored closing up the old co-operative, it was so weak. But another group, composed mainly of younger men, wanted to go on. They reorganized, and the Bank for Co-operatives at Baltimore, Maryland, loaned them enough money to install secondhand presses, refrigerators, and bottling machines for a grape-juice line.

At that time the co-operative had just $89 in cash of its own. Some fruit boxes, insecticides, and general farm supplies valued on the books at $27,000, sold out at 15 to 20 cents on the dollar after a period of years, but didn't help much at the beginning. So the new co-operative really started from scratch.

Now the association does a gross business of one million dollars a year, and pays its patrons consistently $15 a ton more than its competitors. Farmer-members own, clear of debt, a processing plant valued at more than $400,000, have established ample reserve and operating funds, and have paid up all back debts of the old co-operative.

From early spring to late fall, Keystone processes crops from the farms of 270 members within a twenty-five-mile radius of North East. If the grape crop is light, perhaps tomatoes will save the day for them. The season starts when

cherries ripen. By the time the cherry juice is processed, the tomato-juice run starts. Then follow in succession until late fall the grape juice, pumpkin, apple juice, and Irish potato runs.

For their products, processed and sold through Keystone last year, members received $895,000—about $200,000 more than they would have had if they had sold their crop as fresh fruit. In addition, Keystone members left approximately $198,000 in the business to serve for operating expenses and as a reserve.

The plant provides yearround jobs for 80 to 100 persons, and in peak periods for as many as 250 to 300 workers. And these jobs are right in the community—not one hundred miles away in some city. One of the best things about vertical diversification is that it makes it possible for more people who want to live in rural America to do so.

Keystone thus has helped bring prosperity back to the entire North East community—both in town and countryside. But what's more important, it kept North East's farmers "farming."

4. Those Closest to Raw Production Most Poorly Paid

THE LOW INCOME of primary producers is a fact that has borne in on the consciousness of some of the South's most outstanding and progressive leaders. Dean Paul W. Chapman of the College of Agriculture of Georgia is one of these. He has led the thinkers of the South in a crusade to bring industrial processing closer to rural producers. He has written a series of booklets and his articles have appeared in the columns of the *Progressive Farmer,* that rural journal that covers the South like a blanket and whose policies are correctly portrayed in its name. In a recent issue of the *Progressive Farmer,* Dean Chapman quotes George H. Stevenson as follows:

"The tendency of civilization is to make of the farmer a producer of raw material solely, with the manufacturing and distribution entirely in the hands of the highly organized, but not necessarily efficient, urban centers. No industry or nation can long survive solely on a basis of production of raw materials, leaving in other hands the marketing of the material in its raw state, as well as the manufacturing and final distribution to the ultimate consumer. It

is the history of both nations and industries following this course, that the producer of the raw materials becomes steadily poorer, while the distributor and manufacturer become richer and more powerful."[1]

All purchasers resist price increases. Demand for lower prices never ceases. The housewife will tramp from store to store to save a few pennies on her grocery bill. Manufacturers constantly put pressure on furnishers of raw products to force prices down.

Raw-product purchases stand out beyond all others in the minds of purchasing department officials. They are never covered up in overhead, maintenance, or catch-all groupings. Any purchasing agent can state, on a moment's notice, the effect of raising the unit price of a raw product on the cost of his end product.

Manufacturers know that there are but two ways in which they can fundamentally improve the position of their product in the market:

Improve the quality or make it serve in more places.

Hold the quality and lower the price.

Most of them lean to the latter because it is easier, effects are prompt, and it strengthens their competitive position. Furthermore, the manufacturer knows that, as he pushes the price of his product down, he widens the base of his potential market.

The form of the market is a triangle (see Figure 2). As prices go up, the number of potential buyers goes down. There is only a handful at the peak. The mass is at the base of the triangle where low prices and large volume meet.

[1] Vol. LXI, No. 3 (March, 1946), 13.

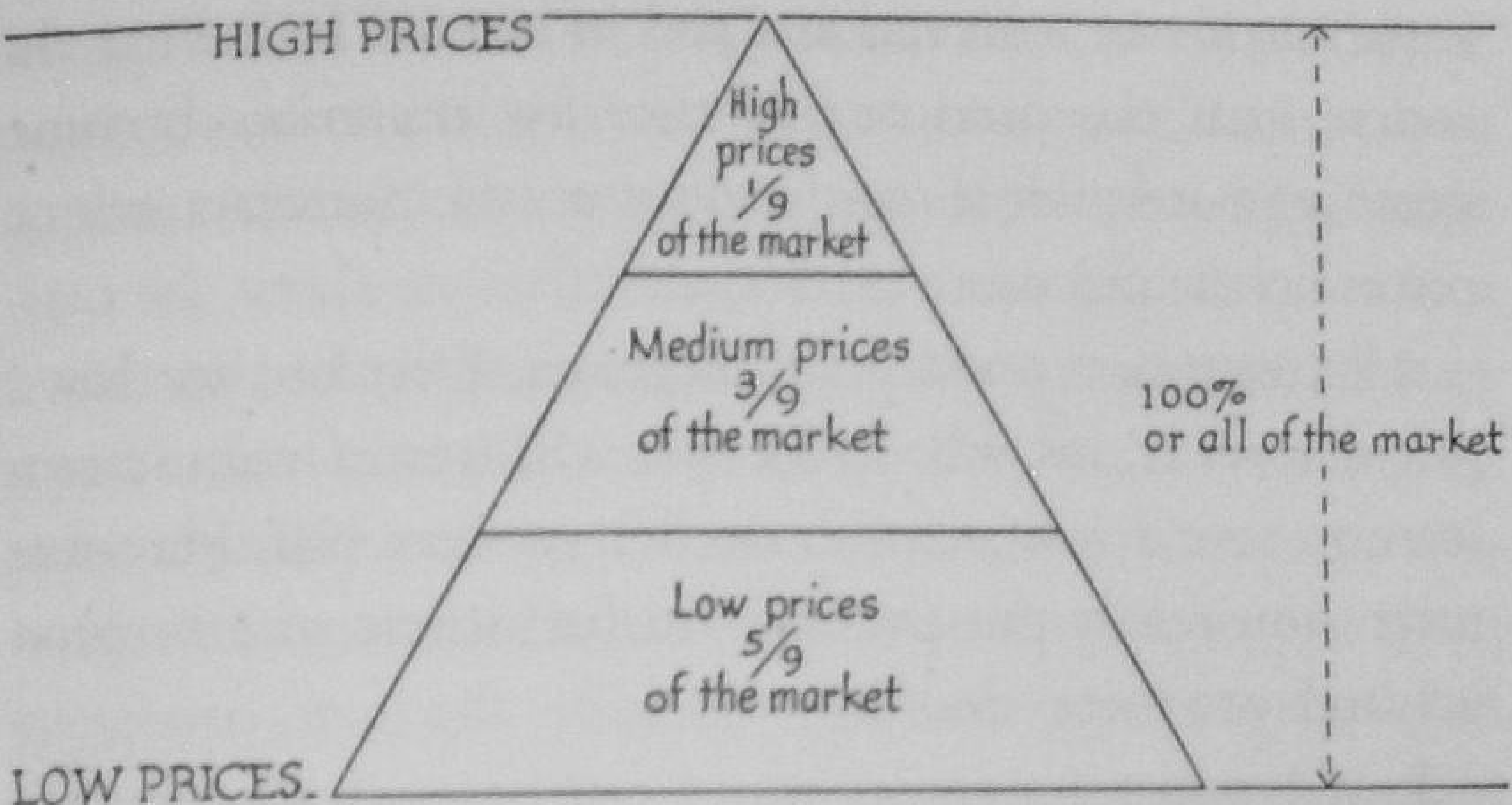


Fig. 2.—A diagrammatic illustration of the form of the general market. Figures are only illustrative.
The higher the price, the fewer the buyers.
Low prices may include *all* buyers.
High prices eliminate a large proportion of the buyers.

The effect of large volume and a wide customer buying range is, of course, well understood by all merchandisers.

From this it is clear why manufacturers press down the prices of the raw products they purchase. Who, then, must make the concessions? The answer is those who are least able to resist pressure and who can take reductions and still stay in business. There is but one group that regularly meets these specifications—farmers. They are the only ones in the long chain of those who handle raw products who can take reductions and not go out of business. The farmer can do it because many of his cost-of-production items are hidden and can be minimized and put off. He can sell the fertility of his soil without restoration for long periods. He can call upon his family for labor without cash payments. Repairs and replacements of buildings can be delayed. Depreciation

is seldom, if ever, counted as a part of cost. When the transporter, warehouseman, or processor figures costs, all items, actual and calculated, are a part of the formula which makes up the price he sets. His calculations show the margins he must have to stay in business and he knows that if they disappear, he will do likewise. Scores of calculations during the early thirties showed how few changes were made in prices by those who furnished services and manufactured products, and how steadily the raw producers took each successive recession.

The industrialist and the farmer work within two different economic formulas. The manufacturer may vary the cost of the items that go to make up his total cost, such as higher or lower labor rates, taxes, or cost of raw products, but there is no way in which he can escape them. The farmer, on the other hand, may not only vary in a similar manner his unit costs, but there are some which he entirely avoids or eliminates. The figures which follow show this difference:

	Basic Economic Formula	
	Industrial Index	*Agricultural Index*
1. Cost of materials	100	80
2. Cost of labor	100	50
3. Costs of selling, overhead and all others	100	70
4. Total cost	300	200
5. Profit or margin	60	0
6. Price	360	?

Let us assume that an index figure of 100 represents all the items which make up the cost of acquiring the raw materials the industrialist purchases. There is no way for

him to dodge a direct payment for them. The price may be high or low, but this makes no difference as far as the comparative illustration goes. The point is that all materials used represent a 100 per cent cost factor.

On the other hand, the farmer who grows corn—or let us say, manufactures it—can turn out his end product without a direct payment for some of the raw materials going into it. For example, most of the substance of the corn comes from the air, water, and sunshine—all free. The minerals which come from the soil may go unreplaced for more than a generation. If manure is hauled from barns and lots, a direct cost is seldom assessed against it. This chain of factors applies to other materials and, to a greater or less degree, to every farm-produced product. The figure 80 is not used to show that the farmer's cost of materials is 20 per cent less than the manufacturer's, but rather to indicate that his direct cost for materials is less.

The industrialist pays 100 per cent for all labor used—administrative, clerical, and manual. Not only is all labor paid for directly, but costs for units of it are high in comparison with farm labor.

By contrast, the farmer uses much unpaid labor in producing the products he sells. The labor of his wife and children, and even his own, are in many instances entirely unpaid. When neighbors come in to help at peak labor periods, they are frequently paid back by exchange, so that this labor is only an indirect cost or an unpaid item. The index of 50 is an arbitrary figure to represent a smaller cost as compared with the 100 of industry.

All other items which go to make up costs of manufac-

tured articles are covered by item 3 in the formula. Again actual as well as calculated and estimated costs go into industrial costs. Seldom, if ever, does the farmer consider depreciation or obsolescence as cost items. Insurance is little more than fire coverage on main buildings; and such things as directors' fees, legal costs, and audits are almost unknown on the farm. This relation is again arbitrarily set as 100 for industry, and 70 for farmers, who pay less.

No industrial concern could continue in business if it did not add a margin above actual cost to determine the price that must be set on the end product. It is recognized as an essential part that must be added to cover hazards and dividends and to creat reserves. The farmer never considers or uses a factor which compares with the industrial margin.

The industrialist sets the price on his own products. He is the only one who has the data to determine price, and, without that privilege, he would have no idea of the outcome after the product was made and ready for the market. The farmer starts his costs in the spring against a product he will sell six to twelve months later at a price he never knows ahead of time and has no way of setting. While many of his costs are less or nonexistent, in comparison with the manufacturer, still others are fixed and are 100 per cent under the control of the seller, such as fertilizer, gasoline, and farm machinery.

This contrast in economic formula brings out the fact that farmers have a long way to go in getting their raw-production costs and selling programs on a basis similar to that of the industrialists. It also shows how materially the farmer's position is improved when he places at least a part

of his operations within the economic formula used by industrialists; that is, when he changes from raw producer to processor. Farmers have lamented from time immemorial: "We sell at wholesale and buy at retail. We pay the price the other fellow sets on his products and take the price he sets on ours."

Not long ago, I purchased from a packer a ham to send as a gift to a friend in a distant city. The packer stated *his price* at his weight and *added* the shipping charges. The transaction was regular and was as expected. Within a few weeks some of my hogs were ready for the market. They were sent to this same packer. He set the price, determined the shrink (which was excessive), deducted the shipping costs, and paid me the difference.

These are typical illustrations of the routes taken and the methods used by farmers and industrialists in merchandising their products. They bring out important points that will be developed later, namely, that the farmer has some distinct advantages over his industrial competitor when he enters the area beyond raw production. Of course, large-scale production often, but not always, lowers the cost of production. Against this the farmer has lower costs for many of the items which go to make up production costs. Industrial efficiency is not such an important item that it rules out all farmer competition.

Here is one illustration, from the files of the *Farm Journal,* of how a former farmhand proved that point.

Twenty-three years ago D. E. Rinehart of Washington County, Maryland, started out as a farm "hand," working and learning as he went along.

In two years he became a share-cropper. Today he farms five hundred acres of the richest orchard and grain lands in Maryland's Upper Shenandoah Valley, and does a gross farm business of around $100,000 a year.

In 1930 he bought seventy acres of badly run-down land at a foreclosure sale. Then he built up the soil, ripped out the old straggling trees, and planted a new orchard of peach and apple varieties that were popular on the market.

Before long he began to wonder, "Why should I sell ordinary fruit when folks pay someone else more for it after it's brushed, graded, and packed?"

The result was an investment of between $15,000 and $20,000—but it made Rinehart his own "middleman." He bought brushing, grading, and packing equipment, erected a modern building to house the equipment, and bought a fleet of trucks to carry the fruit directly to customers.

Rinehart now has retail outlets in Pittsburgh, Baltimore, Cleveland, and Philadelphia for his apples and peaches—and in these cities the label "Mountain View Farms" means "high-quality fruit."

In recent years a new outlet has developed for Rinehart peaches. Increasing numbers of bushels go each year to canners of baby food.

The idea of raising "something special" is not restricted to fruit crops. On one farm, Rinehart has 1,000 laying hens that produce hatching eggs the year round. They bring 12 to 16 cents above the market price. He plans to "hit the extra-price market" again with a brand new Hereford "baby beef" cattle farm he is just starting.

Rinehart attributes a good part of his success to keeping

high-quality men. "Remember, I used to be a hired hand, myself," he commented. "That's the reason you see those Herefords, those Guernseys, and that chicken farm. We want to run a year-round business here."

It's clearly evident everywhere on the Rinehart farms that a farmhand who has an "idea" still can get somewhere in farming.

We are indebted to H. G. Hamilton, professor of marketing in the College of Agriculture, University of Florida, for some very illuminating figures that have a bearing on the price relationships just mentioned. He first showed how the 40 cents a dozen the consumer pays for oranges

	I *Basis $7.1274 a Box*	II *Basis $3.50 a Box*
Pickers	$0.1815	$0.12
Haulers	0.1755	0.10
Packers	0.7238	0.60
Pre-cooling	0.0385	0.02
Freight, icing, average haul	1.1500	1.15
Coloring	.0273	0.02
Selling cost	0.1300	0.10
Advertising and testing	0.0258	0.02
Waxing	0.0250	0.02
Wholesale handling	0.4600	0.35
Retailer	1.8900	1.00
Total handling	$4.8274	$3.50
The grower received for the oranges on the tree as pay for return on land, prorate of growing young orange grove, current operating costs of fertilizer, spray, cultivation, pruning, watering, and management	2.3000	0.00
Total paid by consumer	$7.1274	$3.50

is distributed to the various services. He was then asked to give his best judgment of the same distribution if the same oranges sold for approximately half this amount. His figures are therefore based on one box of oranges retailing for $7.12 or approximately 40 cents a dozen in column I and for $3.50 a box or 20 cents a dozen in column II. (The figures in column II are estimates by Mr. Hamilton.)

This is a most revealing analysis. It is the factual evidence of what farm producers have long felt was the case but has seldom been so clearly shown. Should farmers want more convincing evidence? If they do, they should endeavor to remember what happened from 1929 to 1934. What Mr. Hamilton anticipated, experience again proved in 1946–48.

What did happen—

Citrus crops were not worth picking in some of the areas of the Southwest during those years. In Florida and Texas, box fruit did not pay the cost of picking, packing, transporting, and selling. Juice fruit brought $4.00 per ton, about one-third the price of wheat straw. Low prices for farm products is not the point—they are always with us in varying degrees. The thing to remember is that buyers generally set the price on raw products, while the seller sets the price on nonperishable processed products.

The chart (Figure 3) shows the relationship between prices received by farmers, prices paid by them, wages of industrial workers, and prices of farm machinery. The striking fact is the small variation in farm machinery and the prices received by farmers. Even though farmers' prices went up when the war started, industrial wages went even higher and at a faster rate.

It is important that farmers realize the economic formula within which they work. They have complained about it for generations, but that does not solve the problem. Its solution is best met by becoming a part of the system of which they complain. Of course, many of them have done so, and great numbers are joining forces to do it in greater volume than ever before. Vertical farm diversification offers a route the farmer can take in joining industrialists and still remain the producer of his own raw materials.

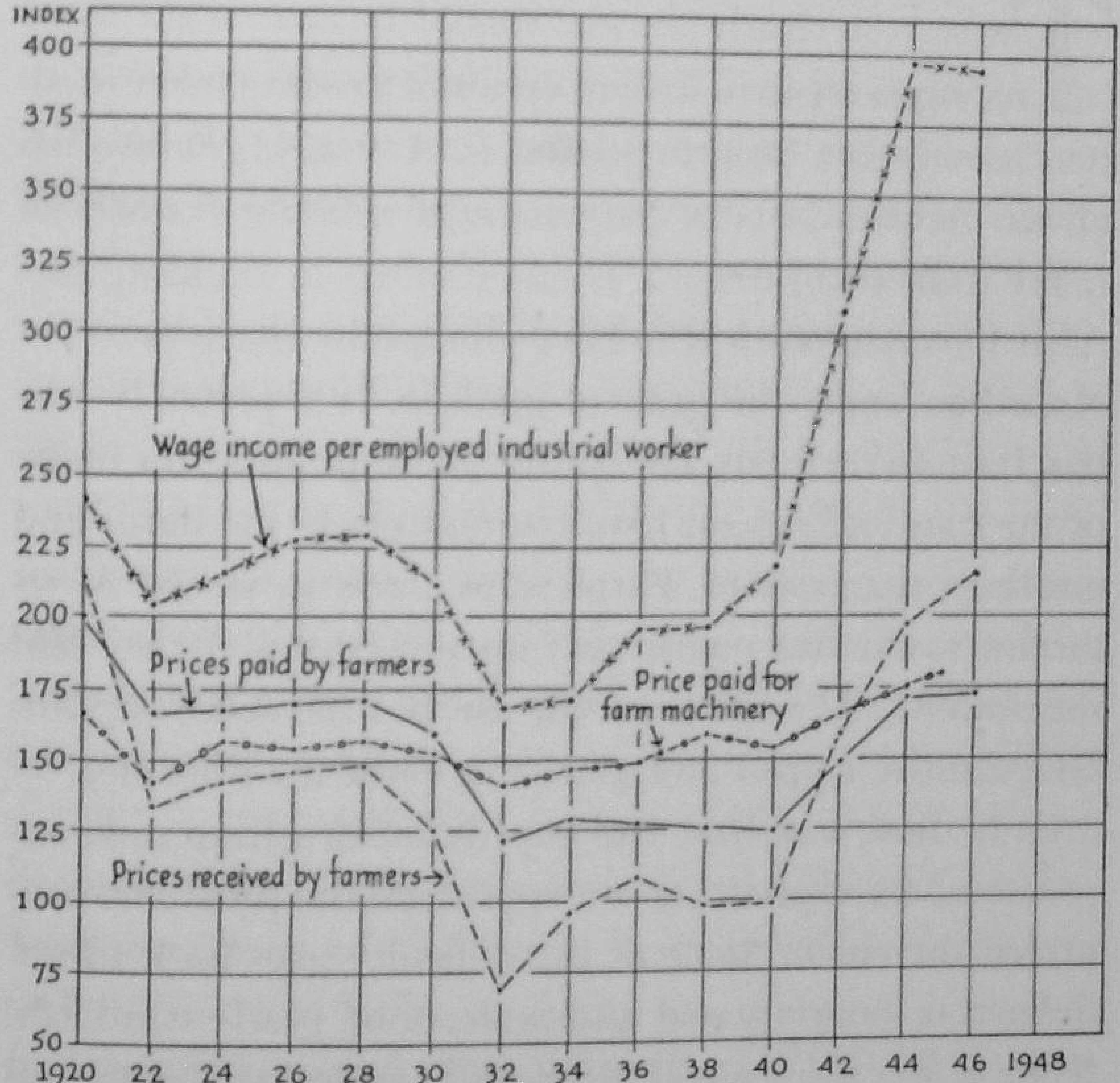


Fig. 3—Index of factors affecting farmers 1920–45.

1910–14=100

(1) U.S.D.A. agricultural prices.

(2) U.S.D.A., Bureau of Agricultural Economics, Agricultural Outlook Charts 1946 (December, 1945), 7.

5. Raw-product Grading Practices Often Injure Producers

THE THEORY AND HONEST PRACTICE of grading farm products have been a boon to producers. Actually, grading has all too frequently been the means of robbing farmers of many millions of dollars. It has resulted in building fortunes for middlemen who have profited by sharp practices carried on under the guise of grading. It is probably true that farmers themselves are primarily responsible for many of the state and federal laws creating grade standards and grading organizations. Farmers, as a whole, would be reluctant to do away with grading procedures if they had the power to do so. It is not the use, but the abuse and dishonest use of a good procedure that cause the difficulty.

Only those who have had experience in selling raw, unprocessed farm products can appreciate the problems connected therewith. Some of the difficulty goes back to undefined or poorly stated and understood grade standards. Some of it is the result of sharp trading, and still much, all too much, is just plain dishonesty.

Perhaps the greatest difficulty in honest grading lies in the fact that, for most farm products, grading is an art

rather than an exact science. Tools and instruments which automatically register grades are few and far between. When they are available, there is a distinct tendency on the part of many purchasers to avoid them. Scales which register the one factor of weight serve as the only tool in fixing grades on a host of farm products. Grade decisions affecting color, flavor, and freshness in fruit and vegetables are matters of momentary judgment and are as variable as the pessimism or optimism of the parties to the deal.

First, let it be known that accurate grading of farm products by honest parties—whether buyer, seller, or a third party such as a government or state agency—has done much to aid the raw producers and protect the merchandiser and consumer. City milk ordinances, followed by proper grading, have made a tremendous contribution to the health of the nation and the lives of countless babies. The grading of some kinds of meat showing degrees of quality has made it possible for the inexperienced housewife to buy high-grade meat, usually at a premium, but with the assurance that she is getting what she pays for. Some areas producing fresh vegetables and fruits have been saved from complete ruin by having a state or federal agency step in and set honest grades on the products, which, when offered on the market, could be bought on the government grade with confidence and safety.

But, unfortunately, there is another side to what is called grading—a side that has definitely harmful effects. Let us now look into some of the common abuses of grading practice.

Milk is universally graded and universally used. Therefore, it offers a good point of departure in this discussion.

Normal cow's milk contains the following ingredients, with variations according to breeds, feeding, and other factors:

	Per cent	
Water	85	89
Fat	3.5	5.0
Casein and albumen (protein)	3.0	4.0
Milk sugar (lactose)	4.5	5.5
Minerals	0.5	0.75

Because of the almost perfect balance in these important ingredients, every one of which is essential to a balanced human diet, milk has an extremely high food value. By the selection of breeds and feeds, it is possible for the dairyman to vary the percentages of some of the constituents of milk as much as 50 per cent. Hence, if the market would grade and pay for high percentages of the elements desired, the producer could go a long way toward furnishing it. However, most milk is sold by the producer and bought by the distributor on one test alone—butterfat. The test is made by the purchaser. The higher the fat test, the higher the price per hundredweight for the milk or cream. If the milk producer "thinks" (he seldom has means for testing his own milk) the test is too low, he can complain and ask for, but not always get, a retest and perhaps an adjustment.

One time I sat in the office of the head of a milk distributing firm and overheard one end of a telephone conversation. The company's field representative was complaining

that the farmers adjacent to a certain field station were shipping their milk to a competitor because they were not satisfied with the price the company was paying. The executive gave the reasons why he could not pay more per hundredweight, none of which were convincing. He finally concluded by saying, "Well, don't raise the price but raise the test until the d—— farmers are satisfied." This is an excellent illustration of how grading can be used as a pricing factor rather than as an expression of quality.

Milk should be graded and paid for in accordance with the degree to which it contains, or fails to contain, its essential ingredients, the degree to which contamination is kept out, and the degree to which diseased cows are eliminated from the herd.

Arbitrary standards are set on factors related to production, which are presumed to affect the cleanliness of the milk. To the extent that they are actual contributions, this is desirable, but all too often they are used to force competitors out of the market, to promote the sale of equipment, and to attain other unrelated ends.

One farmer was informed that if he wished to continue selling Grade A milk in a given market, he would be required to move the wall of his barn back at least six inches. A milk house which was eight by ten feet was approved. Later an inspector informed the farmer that the requirement now was for a house ten by twelve feet. These and many other similar practices account in part for the fact that the number of milk producers in a given milk shed decreased from 12,000 in 1934 to 3,400 in 1946. (See Fig. 4).

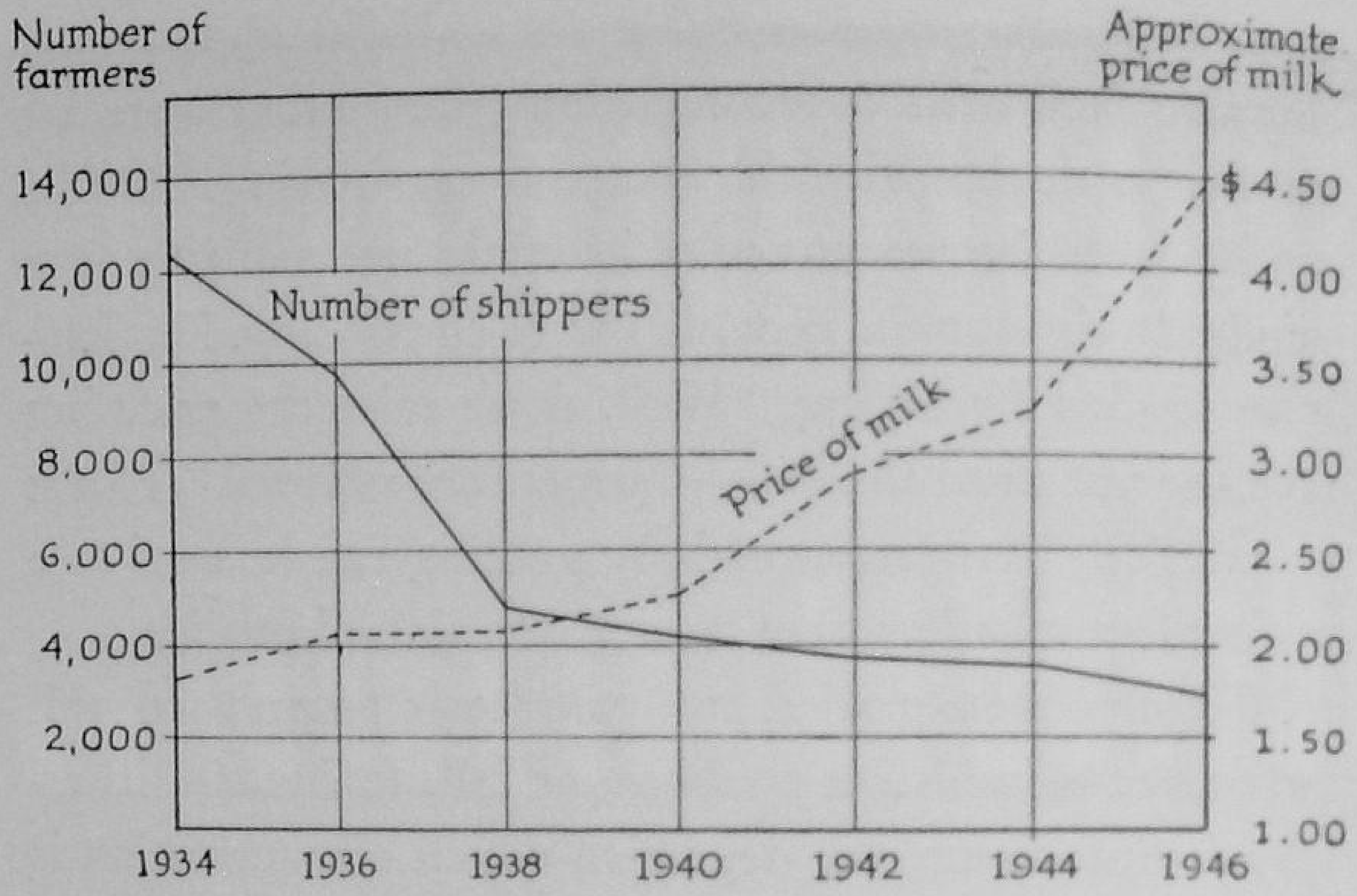


Fig. 4—Number of farmers in the milk shed of a large city, shipping milk for city distribution, and trend in price of milk per 100 pounds for the period 1934 to 1946.

1934. A new city milk ordinance became effective.

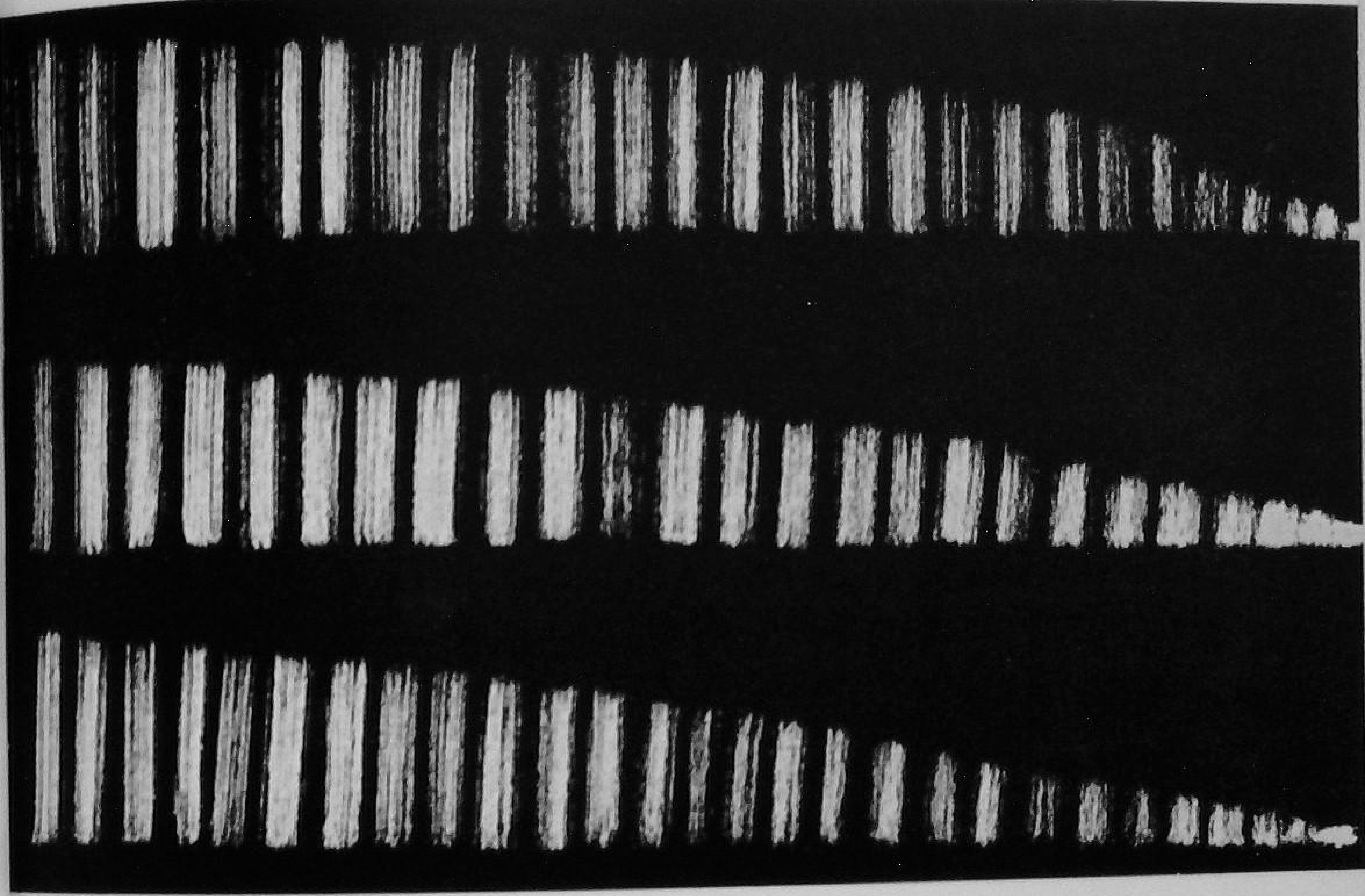
1936. The Standard Milk Ordinance was adopted.

1938. The Standard Ordinance became finally effective, and all shippers of Grade A milk were required to conform. Since that date this ordinance has been rigidly enforced.

1946. Less than 50 per cent of the city's Grade A milk comes from within a radius of 100 miles.

Cattle are presumed to be graded when they arrive at terminal markets in classifications such as the following:

Fat steers
Western range cattle
Butcher stock
Cutters and canners
Stockers and feeders
Veal calves
Milkers and springers[1]



Courtesy Production and Marketing Administration
U. S. Department of Agriculture

The "pinch" of cotton the classer uses to determine staple length contains all the fibers shown in these samples. The top array is very uniform, the middle one average, and the bottom one non-uniform

Fat steers are graded as:	The carcass is graded as:
Prime	Choice
Choice	Good
Good	Commercial
Medium	Utility
Common	
Canners	

Not infrequently the price of a carcass grading "choice" is double that of one grading "utility." Choice steers on the hoof do not always cut out choice, and the carcasses of common steers may go to good or choice. These grade terms and the basis on which they are set tend to cause confusion and misunderstanding. Farmers as a whole are not familiar with either market or carcass grades.

What is more important, those who are responsible for setting the grade when the cattle get to market cannot do it either, if we judge by the variety of stated grades set by the bidders on a given bunch of cattle as they stand in the stockyard pens.

The presumption is that a given grade is the expression of a definite and fixed standard which does not vary. Of course, the price for a given grade may and does vary from day to day, week to week, or year to year. In practice, a given bunch of steers will jump one whole grade, depending upon the strength or weakness of the market. When a farmer starts his cattle to market, he knows neither the grade nor the price that will be placed upon them. Both are set as a result of bargaining between a commission man

[1] H. W. Vaughan, *Types and Market Classes of Live Stock* (Columbus, Ohio, R. G. Adams and Company, 1919), 107.

and a buyer for a packing company or a stockyard dealer and trader. When the market is weak and the purchaser can bear down, he quotes one price for a selected number and a different and lower price for another group. All of the cattle were handled and fed alike, but he can and does force a degrade on a cut simply as a means of lowering his cost price.

A number of years ago, I selected a uniform lot of fat lambs from a large flock. They were selected to make but one grade. When they arrived at the market, however, the buyer insisted on a cut of the light lambs at a lower price. When the weight ticket came through, what he had called the culls were heavier than his tops.

The quality grading of live cattle, hogs, and sheep has in the past resulted in heavy annual losses to the producers of livestock. It should be pointed out, however, that honest grading at its best has also been helpful.

Grades are sometimes affected by sex and minor defects. For years fat heifer calves sold at a discount below the steer calves out of the same cows and all handled and fed alike by the producer. This degrading was stopped only by government pressure after accurate tests had been made which showed that the heifers were not inferior to the steers.

When mule buyers go through the country buying mules to ship south to cotton farmers, they discount a horse mule as much as $25 to $50 in comparison with an equally good mare mule, the two being the same except for sex. When we began managing cotton plantations, I asked many old plantation managers how much difference they made between the price of horse and mare mules. The typical an-

swer was: "I am not willing to pay more for a horse mule, but I prefer him to a mare mule"; "No difference."

In short, mule buyers have in the past and are today carrying on a practice that has cost mule raisers millions of dollars. It is not a reflection of true value and is seldom passed on to the ultimate consumer. I have purchased many plantation mules, but do not recall a single instance where a Southern dealer would make a reduction in price for a horse mule that was otherwise as good, in age and conformation, as a mare mule.

Buyers of live turkeys who purchase them from the growers generally demand substantial discounts for those that have crooked breastbones. This slight defect may have a bearing on the appearance, but certainly does not decrease the intrinsic value of the meat.

The specter of so-called weather and shipping damage hangs over the head of the producer of perishable fruits and vegetables as a constant threat of loss and in some cases complete disaster. This does not refer to actual damage from these causes, for modern weather reporting and storm warnings have reduced losses to small proportions, and normal transportation facilities are adequate to meet most foreseeable needs. The problem of the producer relates to claimed damages that have not occurred, or heavy claims for very slight damage. This situation has almost become a racket. One large producer-shipper told me that less than 10 per cent of his shipments of fresh fruit were accepted without demands for adjustments. It has become an established custom on some markets to make damage claims on almost every car of produce received. The receiver wires

the shipper that his car of produce has been received in bad condition because of excessive heating, freezing, bad handling, faulty packing, or any other reason which may be trumped up. He asks for instructions for disposal, indicating he cannot accept it under the terms of the original purchase. This leaves the shipper helpless, and he can make but one reply—"Sell to best advantage possible"—or he asks the amount of discount that will be acceptable. This whole procedure leaves the producer in a position of never knowing what price he will receive for his products, regardless of market quotations and sale agreements. Individual cases of claimed damage have been traced down and found to be entirely fictitious or based on damage to but one or two units, boxes, or crates in a car. Damage claims mount on falling markets and decrease when demand exceeds supply. Many plans have been tried for eliminating this dishonest practice, but so far with only fair success. Most of them involve the establishment of terminal market representatives, who, of course, are too costly for small or even medium-sized producers.

This degrading of perishable products by the purchaser for the sole purpose of lowering the price is one of the most serious aspects of producing and selling raw perishable products. The manager of a citrus co-operative, in telling of these problems, stated that unjust damage claims on fresh fruit was a constant and never ending problem in his organization, and then added, "But, when we began processing our products, that whole racket stopped at once. We now bill out a car of canned juice or concentrate, in accordance with the order, and we get full and immediate

settlement upon arrival. This one item can be the difference between success and failure in our business."

As soon as the little cotton farmer gets one bale of cotton picked, he takes it to a commercial gin. He may sell it off the wagon before ginning, or have it ginned and the bale delivered to a warehouse. Here warehouse samples are taken and receipts issued, and, with these in his possession, he makes the rounds of the local buyers. The buyer "classes" the cotton by selecting a small bundle of fibers which he parallels with his fingers and then tells the grower his estimate of the length of the fiber within one thirty-second of an inch. He estimates the grade, which is based on color, amount, if any, of foreign material such as leaves and stems, and general conditions of the sample which reflect the way it was ginned. It is noted that here again the buyer is the one who sets the grade and staple. During recent years he has had little chance to vary his bid, for press and radio have kept the farmer well informed on price for various grades and staples. His bargaining then must be on the basis of "class." The position of the buyer-classer becomes immediately clear. Why should he over-class or even class full? Such a procedure would result in raising the price on himself. If the farmer does not accept the first class and bid, he goes to another buyer, who in all probability will tell him his cotton is of a different grade and staple. I have had as many different classes on one bale of cotton as potential buyers who looked at and bid upon it. In short, each buyer classed according to his desire to buy. If he wanted the cotton, he classed up; if not, down. The old familiar

pattern of grading to affect price works with cotton as it does with cattle, oranges, milk, or lettuce.

The stapling of cotton—determining the length of the fibers—is a good illustration of grading as an art. The illustration opposite page 00 shows the different fiber lengths in one finger full of cotton. All the lengths shown are in the hands of the classer when he manipulates his sample. Finally he looks at the sample and by his eye calls it one and one thirty-second or one and one sixteenth, or whatever his judgment indicates. A difference of one thirty-second of an inch in the longer cottons may make a difference of 5 cents a pound in the price.

The essence of the grading of *raw farm products* as it is actually practiced is simply this:

1. Many current grading practices are used not to set a standard of economic values but to affect prices.
2. Grading is not an accurate science, although grades may be accurately described and illustrated. It is the expression of a judgment.
3. Few mechanical instruments are used to set or determine grades; hence honest grading will inevitably vary with the individual who grades from day to day, but vary even more between different graders.
4. The inaccuracy of grading allows unusual opportunities for sharp dealing and dishonest practices.
5. It is almost impossible for the seller to be equally as well posted on grades as the buyer, who, in most cases, is both grader and buyer.
6. With the exception of large operators and strong co-

operatives, the seller of raw products is practically helpless when it comes to extricating himself from the practices that have grown up around what is called grading.

7. Differences in grades may, and often do, vary tremendously on a product taken from a single crop or similar bunch of livestock, but the end product into which they are made is the same and often sells for the same price year after year.

These are important facts for producers of raw products to keep in mind when they give consideration to carrying their products one or two steps beyond raw production. Processed products meet with minimum grade differences as compared with raw, and usually the processed product can be held off the market until it can be sold advantageously.

Raw farm products, most of which have varying degrees of perishability, face all the usual wide price fluctuations as well as competition with other raw products which continue to be produced and sold regardless of profit margins. The pressure is always on the man selling the raw perishable—he cannot hold. For the seller of nonperishables, the pressure is in reverse—he can hold—but the consumer and hence the middleman, if he is in the picture, must ultimately buy.

These grade and price relationships and practices have been dwelt upon at length because of their great importance in selling farm products. Whenever a farmer moves a perishable product, that he has been producing, into a non- or semi-perishable class, he greatly improves his mar-

keting position. This is one of the fundamental reasons why vertical farm diversification plays such an important part in stabilizing agricultural production in the hands of the producer. Beef or tomatoes in a can, oranges in a frozen concentrate, or apples in a bottled drink, have all gone through processing steps that tend to stabilize flow to market and hence strengthen the hand of the producer when he markets them. Time and grade decisions are thus on his side and work in his favor.

6. Production Alone Is an Unbalanced Business

FARMERS might well ask themselves: "Is the exclusive production and sale of raw products a well-balanced and comparatively safe business?" They can get some helpful facts from a study of industrial production. There is a common phrase among manufacturers, "We began making that product to balance our production schedules. Previously we had a thirty-day period when our men and machines were practically idle." Products have been added to salesmen's lines for the primary purpose of balancing loads and increasing the efficiency of sales efforts. The handling of any product that is of necessity seasonal throws a heavy burden on efficient operations. Few businesses can survive on limited operations during fractional parts of the year. Certainly the production of raw farm products is a seasonal business.

A second fact worthy of careful reflection relates to the proportion of the consumer's dollar that goes to the producer of raw products.

Let us follow wheat from the time it leaves the farm to ultimate consumption. A trucker charges for hauling it

from the combine on the farm to the elevator, where a storage and carloading service is added. The railroad hauls it to a terminal elevator, adding two additional charges. The miller buys it, and it is again hauled and stored. Next it is made into flour and other products, which in turn must

TABLE 2

Farm Food Products: Farmer's Share of Retail Cost, August, 1945[1]

Item	*August, 1945* Retail price	*August, 1945* Farmer's share
	Per cent	*Per cent*
Market basket	100	54
Poultry and eggs	100	77
Meat products	100	76
Dairy products	100	58
Fresh fruits and vegetables	100	47
Cereal products[2]	100	40
Miscellaneous products	100	29
Canned fruits and vegetables	100	27
Bakery products[3]	100	24
Eggs	100	79
Fluid milk	100	61
Potatoes	100	61
Evaporated Milk	100	52
Apples	100	50
Rice	100	44
Corn Meal	100	41
Rolled oats	100	30
Tomatoes, canned	100	29
Soda crackers[4]	100	15

[1] U.S.D.A. Agricultural Outlook Charts 1946 (December, 1945), 19.

[2] Other than bakery.

[3] Includes ingredients other than flour.

[4] Flour ingredient only.

be packaged, stored, advertised, and sold to bakers and feed companies. Again it is transported and stored, then made into bread, cakes, and other bakery products which in turn are advertised, transported, and sold to grocers. They advertise, store, wrap, sell, and deliver it to the housewife by whose family it is finally consumed. These are not the only services or related activities for which the consumer pays. Some routes are longer, more complicated, and more expensive.

Many indirect businesses have grown up around such essential processes as growing wheat and making flour and bread. The wheat grower keeps the farm-machinery manufacturers and his local agents in business. If he borrows money to make a crop or buy a farm, he contributes to the existence of the banker, the insurance company, or a federal loaning agency. Insurance on his growing crop, his farm buildings, and perhaps his automobile and truck keep other groups in business. Salesmen for all or some of these services use gas and oil for automobiles which run over improved highways. From this it is clear, without going into the last detail of activity related to the handling and processing of a bushel of wheat, that many urban groups are kept employed as a result of the growth of one wheat crop.

More and more farmers are asking these questions: Why not perform some of these services for ourselves? Why should the one-fifth of us in agriculture receive only one-eighth of the nation's income? Formerly our forefathers grew the wheat and handled every essential step from field to loaf. Little by little others have taken these businesses

from us until now we are exclusive raw producers. Why should we not be doing some of these things to and for our own products?

The production of raw agricultural products is not a well-balanced business. Those who refer to farming as a full-time job see only the fact that a farmer spends all of his time on his farm busy in the fields and on the farmstead. The correct basis for judging the level of the farmer's effective labor is to separate the productive from the nonproductive hours. The time sheet which shows ten or twelve hours of work for the day does not tell the complete story or set forth the most important facts. What we need to know is the amount of productive labor expended. This amount each year varies from one type of farming to another. The rule-of-thumb figure for the productive part of total labor is 85 per cent.

On a plantation in Mississippi, under our management, it was found that, with the use of modern planting and cultivating tools for cotton production, only forty days of labor were required by the share-cropper's family during the nine months prior to picking. On small, isolated tracts where mules were used, sixty days of field labor were required during the nine months. Assuming that every work day during the three picking months was spent in the field —which was not possible because of weather—then the annual productive labor of a share-cropper family would be 118 and 138 in the two cases. Assuming 313 work days per year, this means that in one case 35 per cent of the family's time was productively used, and in the other, 41 per cent. This may be an extreme example taken from a one-crop

operation, but it illustrates the type of imbalance that occurs on many farms.

Many farm studies have found a shortage of productive work to be done in the winter and early spring, and a shortage of labor during the growing season. The graphs in Figures 5 and 6 show typical cases on farms of varying types and for different crops. Farm labor paid for by the

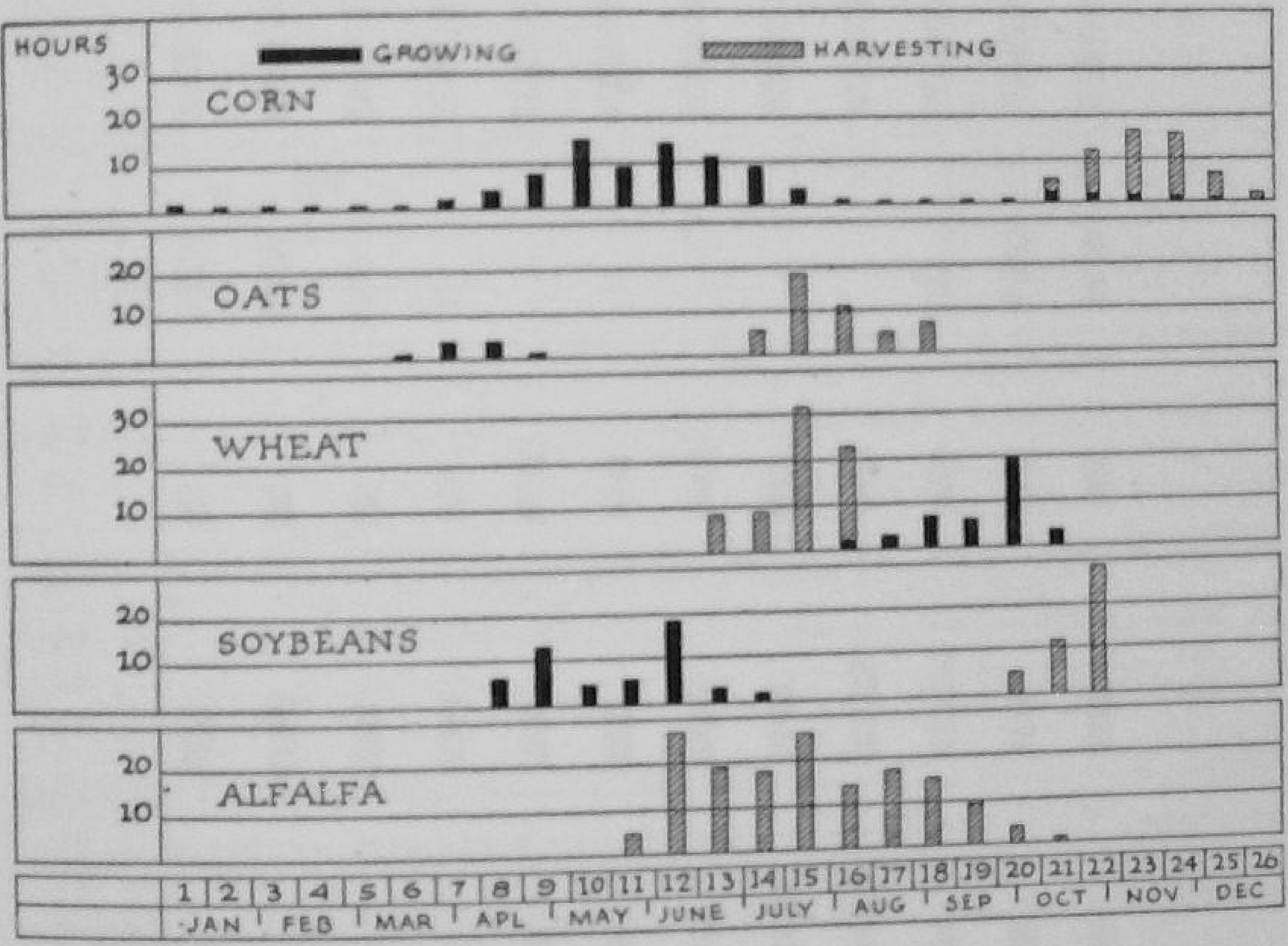


Fig. 5—Hours of man-labor required to grow and harvest ten acres each of corn, oats, wheat, soybeans, and alfalfa.[1]

One of the essential considerations in keeping down costs in crop production is to combine the crops so as to use man-labor to advantage. This graph shows the labor distribution in a rotation of corn, oats, wheat, soybeans, and alfalfa. The bars show the hours devoted to each crop by two-week periods through the year.

[1] H. C. M. Case, R. H. Wilcox, and H. A. Berg, *Organizing the Corn-Belt Farm for Profitable Production,* University of Illinois Agricultural Experiment Station *Bulletin No. 329* (June, 1929; revised, June, 1934), 291.

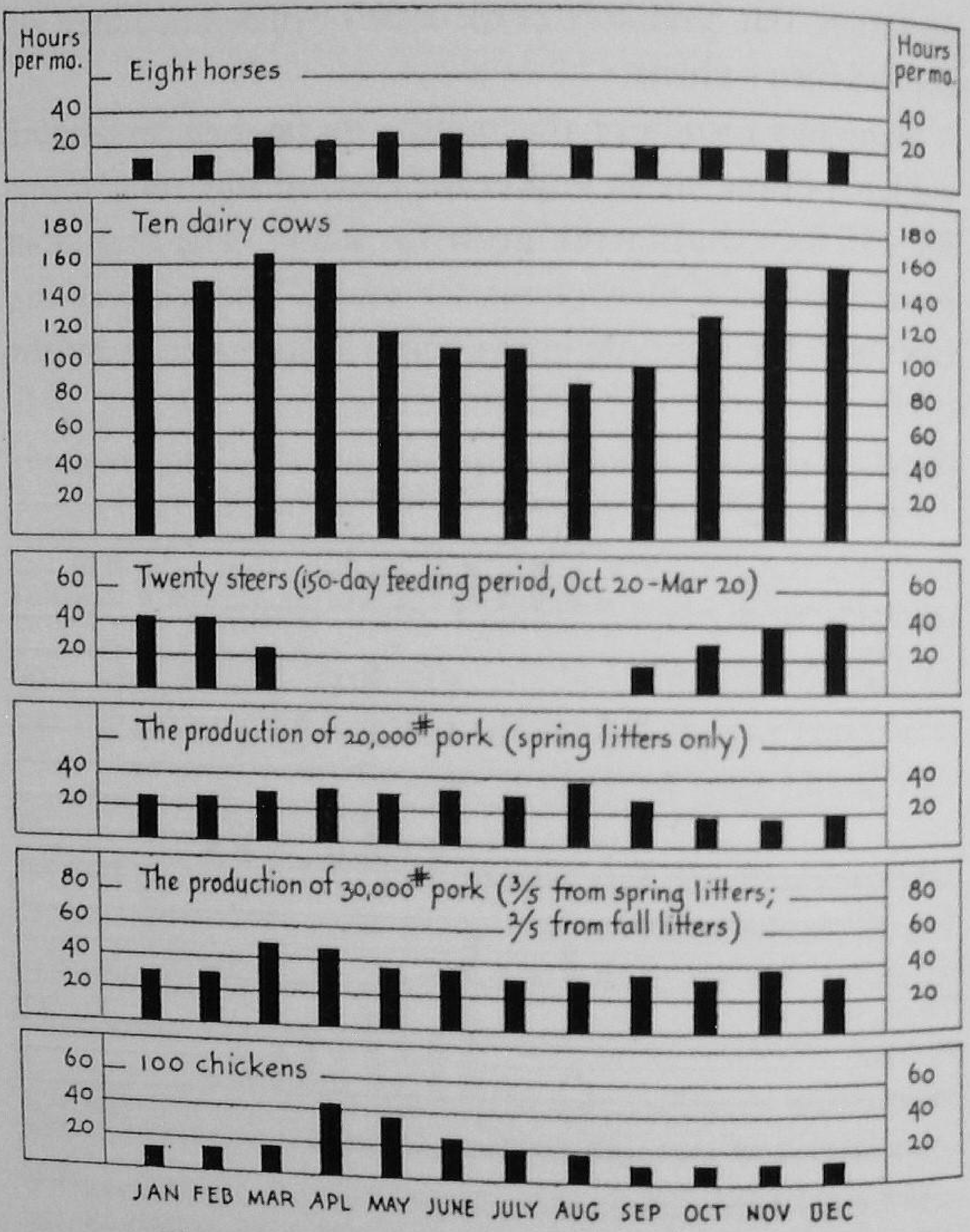


Fig. 6—Hours of man-labor required monthly in caring for livestock.[1]

Some kinds of livestock, such as feeder steers or sheep fed during winter months, require little labor during the growing season and do not interfere seriously with the growing and harvesting of crops. Thus they do help to make possible an economical labor program.

[1] Case, Wilcox, and Berg, *Organizing the Corn-Belt Farm for Profitable Production*, University of Illinois Agricultural Experiment Station *Bulletin No.* 329 (June, 1929; revised, June, 1934), 295.

month or day probably costs double when calculated on the basis of productive labor alone.

Managers recognize that much can be done to smooth out labor distribution. Peaks can be cut off and some valleys filled in by simply working at the job of balancing labor more effectively throughout the year. Time spent at this task should pay excellent dividends. It cannot be completely effective, however, without introducing new and additional productive labor enterprises into the farm program.

On a typical share-cropper cotton plantation, the cropper gets half the crop for his labor. To his labor add that expended for management and other overhead employees such as accountants and stenographers. A 3,000,-bale crop at 20 cents per pound for the lint and $30 per ton for the seed would then be divided thus:[1]

3,000 bales cotton @ $115 per bale		$345,000
One-half to sharecropper	$172,500	
All general management	23,000	
To all workers		195,500
Per cent		57.0
Most cotton manufacturing companies pay for labor and management from 18.6 per cent to 26.3 per cent		25.4[2]
150 plantation families produced 3,000 bales at an average of 125 days' work per year.		
Average pay per family per day of actual work		9.20
Southern textile workers, 35 to 40 cents per hour per 8-hour day		3.00[3]

[1] L. D. Howell, *Marketing and Manufacturing Margins for Textiles, U.S.D.A. Technical Bulletin No. 891* (March, 1945).

[2] *Ibid.*, 58.

[3] *Ibid.*, 69.

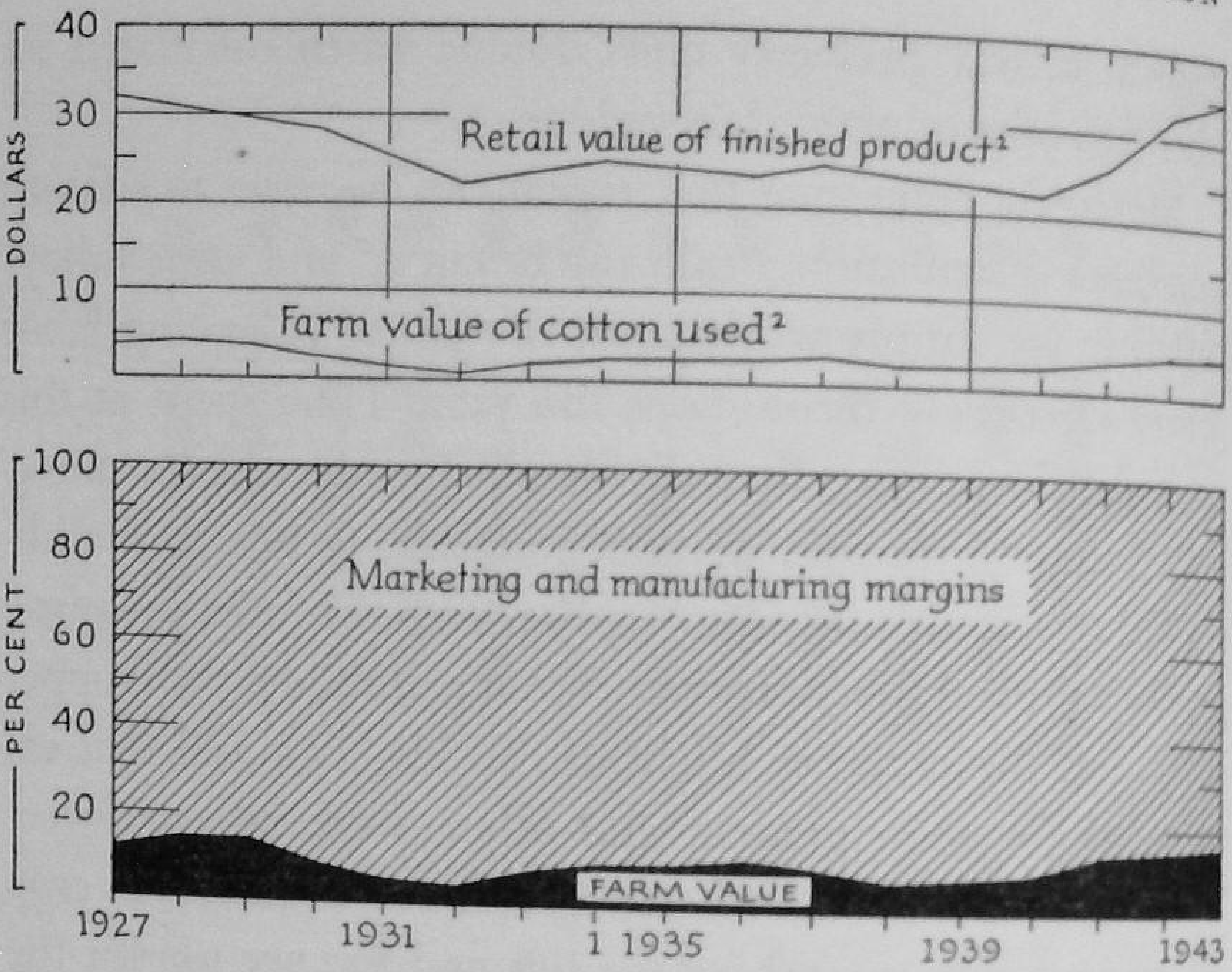


Fig. 7.—Average value of per family purchases of forty-two cotton articles at retail, equivalent farm value of the cotton used in their manufacture, and margins, 1927–43.

[1] Computed from prices collected by the Bureau of Labor Statistics, weighted by average number of articles purchased annually by families of wage-earners and clerical workers.

[2] Estimated prices received by farmers for cotton of grade and staple lengths required in the manufacture of the various articles, weighted by quantities of cotton required.

These are significant figures. Note that the plantation operator pays both a high rate per day, and a very high per cent of his gross income for actual work performed.

The man who manufactures the cotton after the farmer has grown it pays about one-fourth of his gross income for labor. These figures show one of the problems of the old-type plantation operator. Share-croppers are poorly tooled, hence much of their work is hand labor. Those who handle

The working of logs into lumber, then into buildings and equipment, is an excellent enterprise for balancing labor and furnishing winter work

the cotton after production get 92.5 cents of the consumer's dollar while the farmer get 7.5 cents.[4]

The farm value of the cotton used in these articles usually varied directly with changes in the retail value of the articles and the spread between these values usually varied directly with changes in the values of the products. Changes in the farm value of cotton were relatively greater than changes in the retail value of the finished products; and the proportion of the consumer's dollar represented by the farm value of the cotton used usually varied directly with changes in farm prices of cotton.[5]

Raw farm production consumes vast volumes of man, horse, and mechanical power. It required about twenty and one-half billion man-hours of work for the gross farm production of food, feed, and livestock in 1939, along with maintenance of the farm plant. The requirement went up steadily through 1944 when it required about twenty-one billion hours.

The Bureau of Agricultural Economics of the United States Department of Agriculture published, in December, 1945, a report entitled "Farm Production in War and Peace." Indirectly quoting from it, we find that from the end of World War I to 1944 there was but 5 per cent variation in total cropland acreage. During this period, however, gross farm production went up about 30 per cent. The most significant change in this period was the shift of fifty million acres of land from the production of horse

[4] *Ibid.*, 6.
[5] *Ibid.*

and mule feed to the production of food and fiber for human use. It took 20 per cent of our agricultural resources for farm horse- and mule-power in 1919, but only 8 per cent in 1944.

There was a significant change in the volume of production per worker from 1919 to 1939. It increased 14 per cent because there were fewer workers and more production. It jumped 26 per cent between 1939 and 1944. Hence, at the end of the war, a farm worker was producing 44 per cent more than he was in 1919. Farm output per worker went up 70 per cent during the same period. Part of the difference is accounted for by a reduction in feed for teams and labor, and other resources used in their maintenance, which is not counted as "farm output."[6] It took very little more man labor to produce 18 per cent more gross production in 1944 than it did in 1939. It is estimated that about one-fourth of the wartime increase in production per man-hour was because of increased mechanization.

The arguments concerning so-called overproduction or underconsumption will probably continue as long as the one concerning the priority of the hen and the egg. It is not necessary to attempt to settle either of these questions at this point. The farmer, who finds it impossible to sell a product which ordinarily flows marketward without difficulty or obtains only a fraction of what is considered a fair market price, feels that there is a surplus. Memory easily goes back to the early thirties.

Farmers are now being told by government statisticians that they are producing at 130 per cent of normal, so they

[6] Farm output is the measure of farm production for human use.

are asking if they are to be faced with another surplus. Let us say the answer is "yes." What can an individual farmer do about it? He cannot lay off his labor, for that's himself. If he tries to shut up the shop, weeds take his fields and erosion carries off his top soil. Taxes and maintenance costs continue. Livestock must be fed if held, and perhaps the efforts of many years of breeding will be sacrificed if he disperses his herds on low, overstocked markets. No, the farmer cannot shut up shop. He endeavors to produce more as prices go down, for he knows it is volume times price that sets his income. Therefore, he tries to raise volume, which to a degree is in his control, to offset price, which is not. Soon he sees the folly of it all as he continues to force larger volumes on shrinking markets. More production is not the cure for overproduction.

"Why," the farmer asks, "should I not sell the end product instead of the raw? If I cannot manufacture and sell paint, perhaps I can extract the oil from the oil-bearing seed I have grown and get at least one step nearer the finished product." The price of soybeans and cottonseed may have gone down 50 per cent, but the price of a can of shortening or a gallon of paint which contains the oil that came from his flax or beans remains the same.

This line of reasoning and these observations and experiences are playing an important part in preparing the soil for the planting of the seeds of vertical farm diversification.

7. Farm Processing and Urban Industry Can Prosper Together

If vertical farm diversification is widely adopted, will it hurt industry? Yes, in some ways, but it will help it in others. In a free economy, competition never ceases. A big corporation finds that a little competitor makes only a minor dent in its business. The little one often grows to be the big one, and, in time, what was big shrinks and then ceases to exist. From one point of view every corn producer, wheat grower, and cattle raiser in the United States is in competition with every other corn, wheat, and cattle farmer. So, also, when a farmer makes and sells sausage and ham instead of live hogs, he goes from a furnisher of raw products to a packer, and becomes a direct competitor with other packers. To the degree that the farmer takes the packer's customer, he has probably hurt him. The little independents have hurt the "Big Four," but still there seems to be room for all.

Some small enterprises succeed and some make a start and fail, but the last groups in the United States to ask that free competition be stopped would be those who might find vertical farm diversification a real competitor. Indus-

try invites free competition because it is the only way to maintain our American economy.

The question is not one of whether the farmer who processes or merchandises his product will hurt an industry now established, but rather which group of processors and merchandisers can do the job at the least cost and with the greatest benefit to all concerned—the producer, processor, and consumer. Before attempting to answer the question, let's look at some other related facts.

The area between production and consumption, generally referred to as distribution, is admittedly the weakest link in our economy. Steps and services between the two extremes have been added, divided, and subdivided until tremendous costs have piled up, needless burdens to the consumer have been added, and profits squeezed out of production. We ship, reship, transport, and retransport products from the areas of production across the entire country, only to reship back to the point of origin. We have added color, form, and materials to containers that now cost more than the product within them.

There is no justification for steps and processes that make no real contribution. They add to mounting costs and tend to add to a false structure that cannot stand the strains of adversity. Both producers and consumers make demands upon distributors that neither rest on, or have within them, intrinsic value. These demands pyramid during good times and shrink during hard. The degree to which useless noneconomic and wasteful practices can be eliminated will be beneficial to those most vitally concerned—producers and consumers. Hence, if vertical farm diversifica-

tion adds to the real efficiency of distribution, it will be a welcome enterprise which should have permanency and economic stability. There is no doubt but that it is within a field where much remains to be done.

The question is often asked, "How can one farmer or even a group of farmers ever hope to compete with big, established organizations in processing or otherwise handling farm products?" Great corporations such as the meat packers, spinners, paint companies, and many others who use farm products have introduced labor-saving equipment and selling methods that some contend will make competition with them impossible.

First, let us observe that the history of many of today's industrial giants shows that one day they, too, were small. Size is no measure of either high or low production cost. Not all big organizations are low-cost producers, neither are the little ones necessarily high.

Further, the question is not one of turning out an identical product. Rather it is a question of an acceptable product sufficiently serviced at acceptable prices. When we were holding our first Farm Chemurgic meeting in Dearborn, Michigan, in 1935, someone asked Henry Ford's representative, who was showing us automobile parts made from soybeans, if they were as good as those made from metals. He replied that they were not, but were good enough, and added that they served satisfactorily for the normal life of the car. It is important that this point be kept in mind.

When my associates undertook the making of a soybean oil paint, the requirements were these:

1. 100 per cent raw soybean oil.
2. No lowering of quality.
3. Optimum rapidity in drying.
4. Elimination of unnecessary services and processes.
5. Lower cost.

This procedure was followed:

1. Only the best of pigments with no fillers or diluents were used.

2. Raw oil was used just as it came from the bean mill, thus eliminating selling charges, transportation, refining, reselling, retransporting, and a number of other costs, such as advertising, and all the attendant overheads.

The end product was a superior, unadulterated paint that dried fast enough. The plan eliminated services, and hence costs, and the result was the best of paint at half the price of others that were top quality.

Let us turn back to Chapter 3 and look once more at the two formulas under which industry and agriculture work. In analyzing the six steps or divisions, let us apply them to the operation of a farm cotton gin and a commercial gin located in a near-by town. The comparisons are based on personal experience and show many factors advantageous to farm operations in comparison with urban. There may be economies in volume by having chains of gins. However, these organizations face accelerating taxes which is a threat to their existence.

The comparisons follow:

	Farm Gin	*Town Gin*
Cost of land on which gin is built	Farm land price \$50–\$100 per acre.	City lot price \$300–\$1,000 per lot or \$1,000–\$2,000 per acre.

Cost of gin and supplies	Same.	Same.
Cost of labor	Farm labor at farm prices based on year-round employment, no unemployment taxes.	City labor at per hour wages usually 50 per cent to 100 per cent higher than in the country. Employed only for ginning season.
	Gin manager, the farm supt. who is busy on farm when gin is not in operation.	Special gin man employed for 3 mos. only. He is idle when gin does not run.
Taxes-insurance	Farm rates low.	City rates higher.
Other overheads	The operator is also the farm operator; has year round duties.	A city operator on a seasonal basis.
Power costs—fuel, electricity	Same.	Same.
Disposal of wastes	Goes on land as fertilizer, no net cost.	Hires truckers to haul off.
Accounting and records	No extra cost, done by farm accountant.	Hired for the ginning season.

Experience taught us that we could profitably gin cotton on our plantation under conditions that put our urban competitors out of business. The theory of the economy of farm ginning is an economic fact.

Not all farm-city industrial operations show such clear-cut comparisons. The principles are there nevertheless, and they work in varying degrees in all enterprises. A further factor that has a most important bearing relates to costs of administration by farmers on their farms. What is the value

or cost of an hour of the farmer's time when it passes from a wasted or noneconomic use to one that is productive? The farmer answers that question quickly and easily. When asked what his labor cost was under such conditions, he replies, "Nothing. I didn't have anything else to do." That may not be a wholly correct reply, but it illustrates the point that if a farmer can turn otherwise idle or non-productive hours into productive, profitable effort, he is ahead regardless of the return per hour. Perhaps the rate of return is only 25 cents an hour, but he is $100 ahead at the end of the year if he puts in only forty days. That is equivalent to the average gross margin above feed and labor on handling ten steers for one year. If he is so fortunate as to *approach* urban union wages, he would have $400 for his otherwise non-income hours.

Not only does the principle of idle time turned into profit apply to the farmer, but it also applies, in some types of work, to every member of the family of working age. It is of particular significance in relation to year-round hired labor. Farmers' reluctance to employ hands by the year is due to the difficulty of finding work for the winter months. A hand who can work as profitably in the non-crop seasons as within them will be a much better investment than the seasonal employee. Here is an example of how father and sons applied these principles.[1]

George W. Hill, his three sons, John, David, and Guy, and one grandson, Edgar, operators of a hilly 435-acre

[1] From an unpublished story by Ray Anderson, from the files of the *Farm Journal*.

dairy, poultry, and fruit farm in Jefferson County, Ohio, have a common pocketbook, and they keep it full enough so that any one of them may (and does) reach in at will, without consulting the others, for cash to meet living expenses, including the purchase, when necessary, of an electric refrigerator, automobile, or radio.

They keep it from getting empty by "vertical diversification," that farm business practice, often described in recent months by *Farm Journal,* whereby rural producers make their products as near ready as possible for sale to consumers. In the case of Hill and Sons, "as near ready as possible" means all the way. They sell their entire production in finished form delivered direct to consumers. They get all there is in it.

Four days a week a truck goes from the farm to the neighboring city of Steubenville with a load of Grade A pasteurized bottled milk, bottled cream, packaged cottage cheese, cartoned eggs, oven-dressed poultry, and four-pound bags of eating apples for house to house delivery. The housewife may take delivery at the truck, or the Hills put the product on her kitchen table if she prefers.

Now for a little "figgerin' " to see how all-the-way vertical diversification pays. We can't get at it exactly because extra labor of members of the four families is involved, as well as that of the few hired hands they keep, also cost of containers, bottle breakage and loss, and so on. But we can get at it close enough to understand why a common pocketbook is possible aside from the all-important factors of mutual trust and respect.

Hill and Sons have Guernsey and Holstein cows. They

were producing 140 gallons of 4 per cent milk daily when I visited the farm. The bulk of the milk goes for fluid consumption at 15 cents a quart, or 7.5 cents a pound, which compares with the wholesale price in that area (when I was there) of $3.62 a hundredweight or 3.6 cents a pound. Hill and Sons, accordingly, get 3.9 cents a pound for processing, bottling, and delivering that milk. Let's say conservatively that they sell 100 gallons, or 800 pounds, a day in bottles. That means they take in $31.20 more each day than they would if they sold the milk wholesale. In a year that totals $11,388.

But the milk truck also takes eggs to town on the same trip—more than 300 dozen a week. The wholesale price of top-grade eggs at Steubenville was 50 cents a dozen when I was there. Hill and Sons get 68 cents, or 18 cents more, for their eggs. Let's say they market 200 dozen eggs a week, and that's conservative, at this 18-cent premium. That's $36 extra money a week or $1,872 a year.

Then that truck carries broilers or fowl ready to cook. They sell for 59 cents a pound, or approximately $1.77 each, compared with the wholesale live price of 28 cents a pound or 84 cents each. They sell about 1,000 chickens a year, so they get $890 more money than they would if they sold their poultry alive at wholesale.

A four-pound bag of apples brings 35 cents. The apples, the cottage cheese, and the cream bring in approximately $500 extra money each year.

So you see Hill and Sons take in at least $14,640 more annually than they would if they didn't make their prod-

ucts ready for use and deliver them to the kitchen. Probably that's a very conservative figure, too.

They are good farmers, better than average, for the eldest member of the firm, George W. Hill, was declared one of Ohio's "Master Farmers" in 1940, but above all they are "vertical diversificationists" all the way to the ultimate consumer. Small wonder their common pocketbook accommodates handily all demands on it from each family-member of the firm.

Some products do not lend themselves to mass production or, if so produced, are in a weak competitive position. Freshness, special formulas and recipes, and certain types of hand work are factors and areas into which small operations may fit successfully. If in these cases established industries are hurt, it will simply result in a change of emphasis or operation on the part of the one who finds competition hard or impossible to meet. That situation is going on constantly however, and it should make little difference who the competitor may be.

As vertical farm diversification grows, an ever increasing demand for small processing plants will grow with it. They may be furnished by newcomers in the farm-machinery field or by the enlargement of the operations of the old-line farm-equipment companies.

Looking back, we see two distinct periods in the history and growth of farm-machinery companies. From the beginning and up to the successful introduction of the all-purpose tractor, they devoted themselves to making equipment that could be drawn by horses and mules. It was light in weight, and easily man-handled in the field and shed.

Improvements in farm machinery up to about the time of World War I consisted of a slightly better knotter on the binder, a larger sickle bar, a more easily guided cultivator, and other similar changes and adjustments. This is not a criticism of farm machinery as we knew it in those days, but rather an attempt to show that for many years there was no bold launching out into new fields.

With the coming of the all-purpose tractor a new high plateau of production was reached almost overnight. Not only did the farm-implement companies furnish equipment, but they also entered the field of power production. The displacement of the horse and mule by tractors and trucks marks one of the most significant chapters in American agricultural history. Tons of iron and other metals now took the place of tons of horseflesh. On the basis of

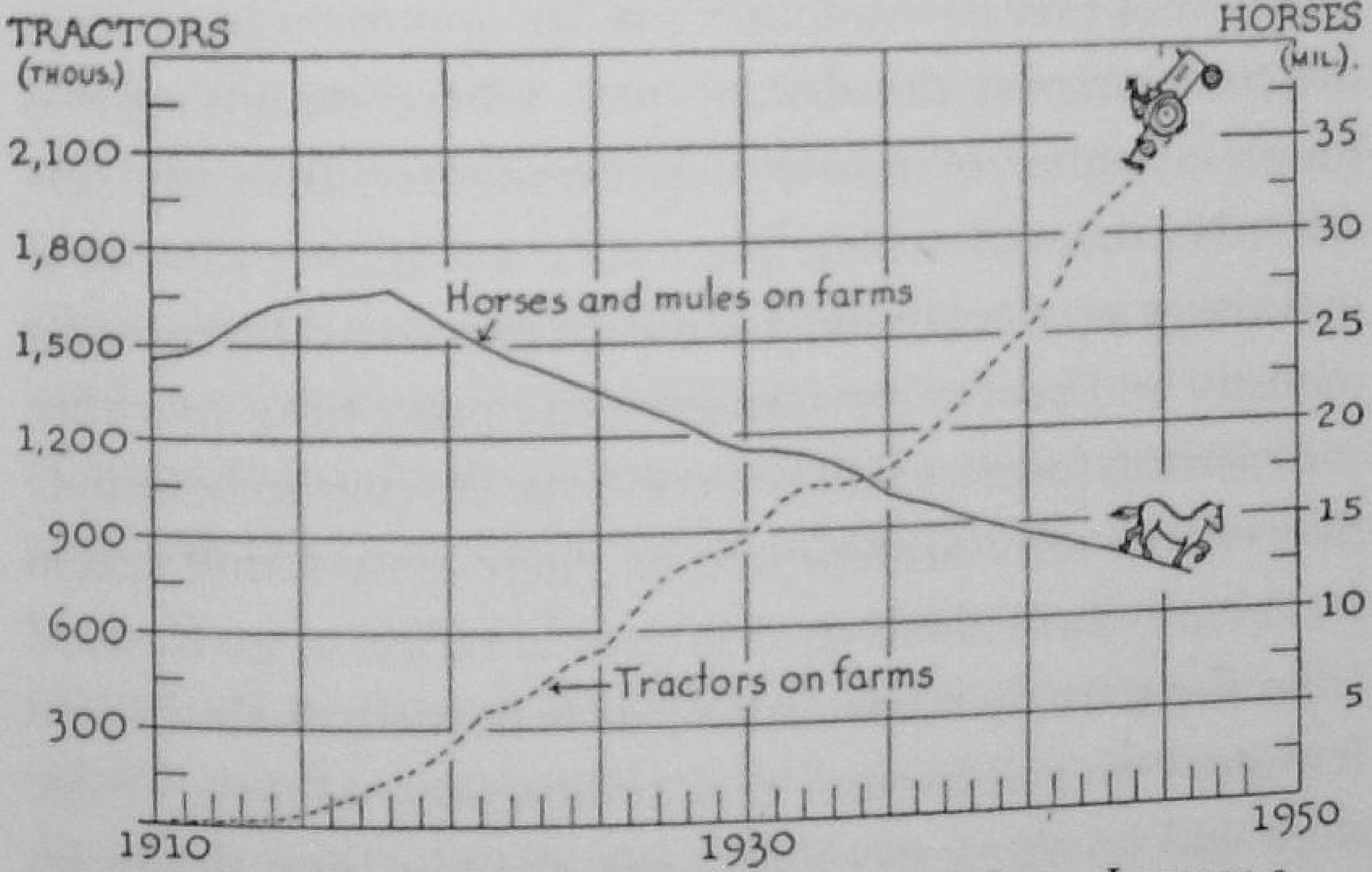


Fig. 8—Horses and mules, and tractors on farms January 1. United States. 1910–45.[1]

[1] *Doane Agricultural Digest* (November, 1946), U.S.D.A. data.

two million tractors and twelve million horses and mules on farms, it is probable that the total pounds of actual work animals and pounds of metal in tractors are about the same —eight to ten billion pounds each.

This was not the result of improvement alone, but rather a substitution, an invasion, and indeed a most significant one. Also a new and distinctive pattern came into the implement field. No longer could a man throw his tractor plow or cultivator around at the end of the row by a dexterous twist of the wrist. More power demanded heavier tools that could not be easily bent, twisted, or broken when powered by a tractor instead of a horse. Adding both the tractor and heavier and more pieces of farm equipment together, the implement companies jumped to new and undreamed of volumes of production.

Will they ever have another similar opportunity, or must the future repeat the distant past where designing was simply a matter of minor improvements? It is my considered opinion that there is another still higher plateau of machinery production which means expanded business for industry and profits for farmers—the processing machine.

American farmers will not continue forever to be simply tillers of the soil—nothing more. There is no sound reason for them as individuals or as groups to refuse to go forward from the start they have made in following their crops a few steps up and beyond raw production. Many of these steps will involve processing—not the big kind urban industry has undertaken, but the little kind adapted to one kitchen, one farm, or one local community.

The required machines will fill entirely new fields in

comparison with those designed for tillage, planting, and harvesting. They should, and in the end will, be *units* of processing equipment. One unit will be the smallest for practical independent operation. More capacity will be attained by adding additional units. Each will be self-contained and be so constructed that a user can order it and have it installed with no more discussion of detail than is now necessary in ordering a cotton gin or a grain elevator. Each unit will come in a "single package," so to speak. Some will be less efficient than those installed by giant corporations, but they will also be less expensive, require less maintenance, and suffer less depreciation. They must be so simple that semiskilled men can operate them. Their cost should range from $5,000 to $25,000 for those in the upper brackets and from $500 to $5,000 for those that are smaller and less complicated.

The fields into which these processing machines will fit are discussed in a later chapter, but may be simply listed here. They are extraction, digestion, dehydration, freezing, compression, fabrication, separation, distribution, concentration, grinding, and classifying.

Thus it would seem clear that urban industry would still have its full share from the development of vertical farm diversification. Industry will make the machines, furnish the chemicals, supply much of the power, and finish many of the products that are taken but one or two steps on farms. It should not be too difficult for a group of cotton or soybean growers to press the oil from the seed. It is hardly probable that farmers will make all the final products such as shortening, lacquers, plastics, and chemicals. Products

that now flow direct from field and barn lot may pause for initial processing, but in the end still feed the great industries of our cities.

Mr. True D. Morse, president of Doane Agricultural Service, Inc., a student of and a practical operator in the field of farm management and community development, has stated:

"To the farm community, farm factories and rural industries can mean diversified income, higher local employment, employment for farm families in idle seasons, huge savings in shipping bulky waste, a new source of concentrated raw materials from the farm opened to industrial manufacture.

"Yes! These are urgent considerations. A turn in the economic road has come for agriculture. Farmers suffer first and most after war-inflation periods. There is something that can be done. Opportunities for work can be brought into your community. Markets can be moved closer to your farms. More processing of farm products on your farms and in your communities will increase your income. Farm youths need not migrate to distant cities. Opportunities can be created for them at home."

If vertical farm diversification ever becomes a serious threat to our cities, it will be because there is within the plan a vastly superior way of handling raw products than those that have, as yet, been discovered. True, there will be shifts, adjustments, and changes. These are going on constantly. The chemical industry put the indigo growers out

New continuous steam still for producing gum turpentine and rosin

of business, but neither these growers nor agriculture in general was seriously crippled. Change, competition, new ideas, and shifts in population and industrial centers have not caused the ruin of America, but rather are the outer evidences of growth and an ever increasing prosperity for all.

8. Should I Undertake Vertical Farm Diversification?

IN THE PRECEDING CHAPTERS we have noted the difficulties of the producer of raw farm products.

Is there a solution? Yes.

Instead of horizontally diversifying, as in the past, in an effort to spread risks, the farmer is now offered an opportunity not only to continue maximum production but to emphasize the production of his most profitable crop and follow it one or more steps above and beyond raw production, vertically. He may also diversify below the line of completed production as will be shown later.

The moment a farm crop or product finishes its cycle of growth or development and is ready for removal from the farm, it is considered a raw farm product in trade circles. At this point many hands reach for it, and then begins a series of activities that finally prepare it for consumption. A fairly complete classification of these steps and processes may be listed as follows:

The Route from Production to Consumption

1. Hauling and transporting
2. Storing and warehousing

3. Cleaning
4. Grading
5. Ripening and conditioning
6. Processing
7. Packing
8. Preserving
9. Freezing
10. Spinning
11. Weaving
12. Fashioning
13. Packaging, wrapping, and canning
14. Insuring and bonding
15. Commission selling
16. Advertising and promoting
17. Wholesaling
18. Retailing
19. Delivering
20. Servicing

Vertical farm diversification may be very simple. Many producers have practiced some phases of it. The farmer who stores and then hauls his own grain to market has taken two steps. The feeding of livestock is the process of converting grass, hay, and grain into meat. The separating of cream from milk, the making of butter, and the producing of eggs and broilers are all steps along the vertical diversification route. A single farmer may do all of these, but he misses the point when he approaches the problem from that angle. The greatest gain comes from taking these steps only after careful study and planning, and relating them to his most profitably produced crop or product. Below are listed eight steps to be taken.

1. Determine that crop or product to which the farm and operator are best adapted and the production of which has shown, over the years, the greatest profit—or promises, for the future, highest returns.

2. Make a study of every step through which that product normally flows. Trace it as far as possible regardless of whether it seems presently possible to undertake all the steps or not.

3. Think of the first thing that happens to the product as it normally leaves the farm, and ask two questions: (a) Can I, as the producer, perform that service better? (b) Can I do it for less cost? These two questions should be answered in all cases. They are as important for the individual as for the co-operative.

4. If it seems feasible to undertake the first operation, then in like manner analyze the second, third, and as many others as the product goes through. Each must be considered in light of the fact that the operations must be performed by the producer or his associates, and must be done in addition to the production of the raw product rather than in place of it, requiring the abandonment of the farm.

5. Determine the degree of reorganization of regular farm activities that these new operations will entail. Make certain that the loss from abandoning or modifying an old enterprise will be more than offset by undertaking the new.

6. Look with particular favor on those operations which are already closely related to the farm and farming. If a new or different product is created, determine the degree to which other farmers become your own market, or whether a new and distant market must be found.

7. In cases involving the sale of additional products, make certain that they will have as dependable a market as the original single raw farm product. For example, it should be no more difficult to sell a car of oil and one of meal than an equivalent volume of beans or cottonseed.

8. Study processed products purchased *for the farm* that are used in production or maintenance of enterprises already in effect. When they are created or processed, it is re-

ferred to as diversification below the line of production. Can feed be ground and mixed? Can fertilizers be mixed, homemade, or grown? Can needed seed be bred and prepared for planting, or can certain tools be fashioned that are more effective than those now available?

Let us assume that one or more Midwestern farmers agree that the crop they grow most profitably is corn. In the past it has been shucked and cribbed, and sold to a local elevator or truckers, or shipped to a terminal market. It now seems advisable to study possibilities for handling all or part of the corn crop beyond raw production. A diagram for the uses of the crop would show the following:

Broad Subdivisions for Using the Entire Corn Plant Suggesting Processes and Products Which May Be Obtained

		Process	*Product*
		Ground	Chops, meal, flour
		Lye treated	Hominy
	Grain	Separated	Grits
Mature Corn		Fermented	Alcohol
Plant		Processed	Starch, sugar
Ears are			Chemicals, oil
Shucked			Protein feeds
Cribbed			Syrups, beverages
Shelled			Breakfast foods
Three types of		Ground	Feed, fillers, litter
corn			Air-blast material for
Field	Cobs		cleaning plastics
Sweet		Processed	Chemicals
Pop			Maple flavor
		Cut	Silage, feed, litter
	Stalks	Ground	Bedding, insulation
		Digested	Paper, insulation
		Pressed	Wall board, building material

Farmers are already familiar with many of the steps shown in the foregoing such as:

From the stalks:
- Feed
- Bedding

From the cobs:
- Feed
- Litter
- Extraction—for syrup

From the grain:
- Shelling, hauling, storing
- Making chops, meal, flour, grits, hominy

Some of the processing is quite complicated and involves the use of highly skilled technicians and big investments, as in the extractions of corn sugar, starch, and oil. The making of breakfast foods, on the other hand, could become a profitable small-scale farm business. In some areas special types of corn are now grown and ground into meals and breakfast foods.

There are corn products that could be bought at wholesale such as corn syrup which, when mixed with the maple flavor from the cobs, could be made into marketable table syrup. New uses for ground and sized corncobs have been found. They are used for removing carbon and grease from motors and other machines.

This explanation is not intended as a detailed description of plans for going into the processing of corn; rather, it shows how the various steps and processes may be spread out and studied before embarking on any one of them.

Pearl Harbor stopped the shipment of tapioca starch from the Dutch East Indies to the United States. Ameri-

can industry could ill afford this loss. Some of the finest adhesives that we have are made from it. The government turned to the scientists, industry, and agriculture. These groups, working together, solved the problem.

In 1908, Rev. J. M. W. Farnham, a missionary in China, sent the Department of Agriculture "a peculiar kind of corn." It was planted as a curiosity, for it appeared to have no commercial possibilities. However, the seed was not abandoned and from time to time it was tested and analyzed. H. M. Hixon of the College of Agriculture at Ames, Iowa, began working with it in his laboratory. He, in cooperation with others, found that the properties of the starch paste were similar to that of the starch from the Cassava plant, from which came our tapioca starch.

With this information available, Merle T. Jenkins and G. F. Sprague, plant breeders from the Iowa Agricultural College and the United States Department of Agriculture, began work on the transfer of the waxy starch characteristics of the Chinese corn to some of the inbred lines and hybrids adapted to Iowa conditions. A field and a greenhouse crop were grown each year, and by 1939 the first of the waxy double crosses, Iowax No. 1, was ready for field trials. The field trials showed this hybrid to have a satisfactory performance. Tests of the starch revealed that it could be used as a satisfactory substitute for tapioca starch. The commercial utilization of this material was no more than a faint hope, consequently no attempt had been made to build up seed stocks in quantity.

The outbreak of the war in the Pacific changed this picture completely. H. H. Schopmeyer, director of research

of the American Maize Company, had been familiar with the work under way on the development of waxy hybrids and had sponsored a part of the work on the chemical and physical properties of the starch. Arrangements were made by the American Maize Company and Iowa State College to push the commercial production of the waxy hybrid as rapidly as seed stocks and facilities would permit. At a somewhat later date National Starch Products, Inc. became associated with the American Maize Company in the commercial phases of this program. In the first year of commercial production a few hundred acres of waxy corn were grown on college land. On the basis of this experience it was quite apparent that the college had neither the facilities nor the personnel to handle the commercial aspects of this problem. The Doane Agricultural Service, Inc. was asked to take over the task of contracting with farmers to grow this new corn, called "Waxy Maize." The company offered a premium and the sign-up started. All available seed, 47 bushels, was planted; and in 1942, 13,240 bushels went to the starch company. The planting has continued to expand.

Robert P. Bear, a graduate of the Illinois College of Agriculture, discovered in one of his corn-breeding plots another "peculiar corn." It proved to be a waxy sport. He named his new find "Tapicorn." It has been crossed with a high-yielding hybrid and it, too, is being grown to add to the Waxy Maize of Iowa. In developing the Tapicorn hybrid, a few blue kernels appeared. This blue-kernel characteristic has been retained by Mr. Bear as a trade mark for his variety of waxy corn.

The Waxy Maize story has a number of significant implications: It is a fine demonstration of how state, federal, and commercial organizations can work together in solving an important problem; it illustrates a relatively new application of plant-breeding principles for creating new crops to meet industrial specifications; it shows how an entirely new crop can be brought to the United States and made available to the farmers of this country without going through the long years of trial and error that generally accompany new crop introductions. In Waxy Maize and Tapicorn we have a new crop grown and handled like an old crop, that is noncompetitive with any other crops, and it brings to the farms and industry of the country new opportunities for greater income and expansion.

For all practical purposes our plant breeders have hooked a new tropical crop on to an ear of Iowa corn by simply changing the form of the molecule of starch.

This achievement marks the beginning of a new day for plant breeders, farmers, and industry. We will hear a great deal more about the breeding of crops to industrial specifications. Undoubtedly farmers will avail themselves of this chance to expand income within the framework of those crops and methods with which they are now familiar.

9. The Kitchshop

Electricity has brought to the farm home what the internal-combustion engine brought to the farm. Now farm women can and will do what their husbands have done in substituting mechanical power for human muscles. The farmer's wife will use new electrical helpers to do the heavy work, increase her efficiency, add new products to the family diet, develop home income products, and create leisure and comforts.

The farmer has long had his workshop. Now his wife may have her processing shop. Suppose we call it "The Kitchshop." Here all processing of foods can be done in a room specially constructed and equipped for the purpose. It would not be a part of the kitchen. It would not contain pots, pans, and gadgets for making meal preparation easier.

The completely equipped Kitchshop would be used for the processing of a great variety of farm products and household needs. It should, however, contain the electric freezing equipment now certain to be a part of many modern farm homes. New grinding equipment for making breakfast foods, flour, and meal would be available.

Modern pressure cookers built as stationary equipment would cut the time necessary for canning and would facilitate and speed up all processes which need the application of heat for sterilizing, pasteurizing, and preserving. A built-in hydraulic press would aid in cheese making and the extraction of juices from fruits and vegetables. Grinding and mixing machines for handling such products as sausage, hamburger, and minced chicken are other types of equipment that would be useful.

Soap-making equipment and methods which would produce a soap comparable with that now purchased on the market would lighten that task and improve the quality of the product.

Not only would simplified, efficiently powered equipment be available, but all facilities for necessary packaging would also be a part of the equipment. If, for example, it was the housewife's desire to prepare flour, meal, and breakfast foods, she might set aside two or three hours on a particular day for that purpose. These products would be put into moisture-proof packages, sealed, and otherwise handled just as if they had been obtained from the local merchant.

During butchering time in the winter, all facilities would be on hand for making a wide variety of meat products—either processing them for canning purposes or placing some of them in moisture-proof containers to go into the deep freezer.

Small pasteurizing equipment adapted to home use is now available. It should make a major contribution to the health of the family and in some instances make it possible

to retail limited amounts of milk to customers living in areas where natural milk cannot be sold on account of city ordinances.

Much has been written about keeping the boys on the farm. It is equally important that girls should want to remain on farms. In the past their earning possibilities have been limited. Even those who have participated in 4-H Club work find that unless they get into the groups originally planned for the boys, such as calf or pig clubs, they are left only those which have to do with dressmaking, canning, and home decoration.

The Kitchshop would appear to be one answer to keeping the girl on the farm and providing for her there a business of her own. Even better, mother and daughter could create a working partnership. Each could do that portion of the work she enjoyed most or to which she was best adapted. With modern equipment many of the burdensome, disagreeable tasks would be eliminated. Using only the best, proved recipes, packaging attractively, and delivering promptly should assure a quality of product now seldom found on commercial markets.

Few of us who have tried to think these possibilities through have yet seen the end. There is much that can be done that has not yet reached even the realm of dreams. Here is an opportunity for farm women to make plans for the development and utilization of a modern Kitchshop. It will be a room devoted to efficient *processing*. It will not be filled with makeshift gadgets. In her Kitchshop the farm wife will have equipment that is as efficient and modern

as a tractor, combine, or cotton picker. She will do as good a job as the food processors with whom she may compete. She will have the incentive for lowering costs for products for her own table, and the incentive for extra profits from those products which she can sell to a discriminating trade. Processing can be done within short intervals so that the products will be fresh. Modern power, modern refrigeration, modern heating, and modern air conditioning will all make their contribution to the comfort, convenience, and efficiency of the Kitchshop.

Let us analyze a single project, a poultry enterprise, and note the successive steps that may be taken from raw production to the finished product.

1. The owner of a farm flock of hens sells eggs as the main product. A huckster or local produce dealer picks them up at the farm-home door. Sold in this way, they bring the lowest price—only that which goes to the raw producer. The producer has performed no grading, packaging, or marketing services, hence the costs and profits go to someone else. As the farm woman contemplates this fact, she decides to perform at least one more step beyond production.

2. She purchases crates, fills them with eggs, and delivers them to the town merchant paying the best price. This increases the amount she formerly received, for now she has bulk-packed and delivered her product.

3. One day she watches the merchant grade, candle, and repack her eggs. Upon inquiry she finds that in this form they bring a still higher price, so she takes on this task.

4. Next she gathers eggs twice a day and removes the roosters from the flock so that she can sell infertile eggs. As the eggs are gathered, she grades for size and color, and, to make certain that there are no interior defects, also candles them. If any are soiled, she cleans them. Instead of putting them in a crate, she packs them in dozen-size cartons on which is printed her name, address, and "guaranteed fresh and infertile." Again up goes the price, for she has once more performed an additional service.

5. She notes that her produce dealer resells to the grocer and he in turn to the individual consumer. After studying what would be involved in a house-to-house delivery service, she decides to undertake that task. This then completes the egg route from farm to consumer. She now receives not alone the return which goes to the raw producer, but also the margins that go to middlemen for their services as graders, packers, and distributors.

Better than descriptions and suggestions of how vertical diversification may be carried out are illustrations taken from actual experiences. The story of how Mrs. Alma Peters of Nebraska has grown from poultry raiser to product developer and distributor is most interesting. This story, by J. C. Baker, is taken from the December, 1944, issue of *Poultry Tribune*, one of our outstanding poultry journals. Editor J. H. Florea is a firm believer in and a consistent supporter of vertical farm diversification.

"Even though Mrs. Alma Peters sold 1,500 cans of fried chicken last canning season and, in addition, scores of cans

of giblets, chicken soup, and 150 cans of young roast duck, her customers hungered for more.

"The Nebraska farm wife's thriving business started as the result of a gift. Twelve years ago, energetic Mrs. Peters sent a can of her golden-brown fried chicken to her cousin, Lloyd Rhorke, in Chicago, Illinois. He knew what a delicacy was in store, so the Rhorke family served the chicken to some Chicago friends.

"The guests smacked their lips over the first piece and asked for, 'More, please!' When the last savory drumstick and thigh were stowed away, the guests hopefully grabbed for the stripped wishbone.

"Yes, you've guessed it! They wished their hosts would ask Mrs. Peters to sell them some cans of her fried chicken for their own use.

"She did, and right away more requests came from other people. Within a few years her fried chicken became so famous she was filling quantity orders for numerous grocers in the Chicago area. Then some of her best customers moved to California.

"Lost business? No! Their moving merely meant that now she is selling other Californians large orders of her canned fried chicken at fancy prices.

"Mrs. Peters raises her own fryers. 'I usually buy 600 to 800 baby chicks from the hatchery at one time,' she says. 'Last year I bought 1,400 altogether for my canning season. I prefer Austra-Whites for canning. I raise my chickens in brooder houses on clean range and seldom lose more than 25 out of 600 chicks.

"Killing and Dressing Procedure

"'At from three to four months old, they are ready to fry. They will average from 4 to 4½ pounds in live weight, and from 3 to 3½ pounds when dressed. I do not feed the fryers on the day I kill them, which makes the dressing easier. I kill them by chopping off their heads.'

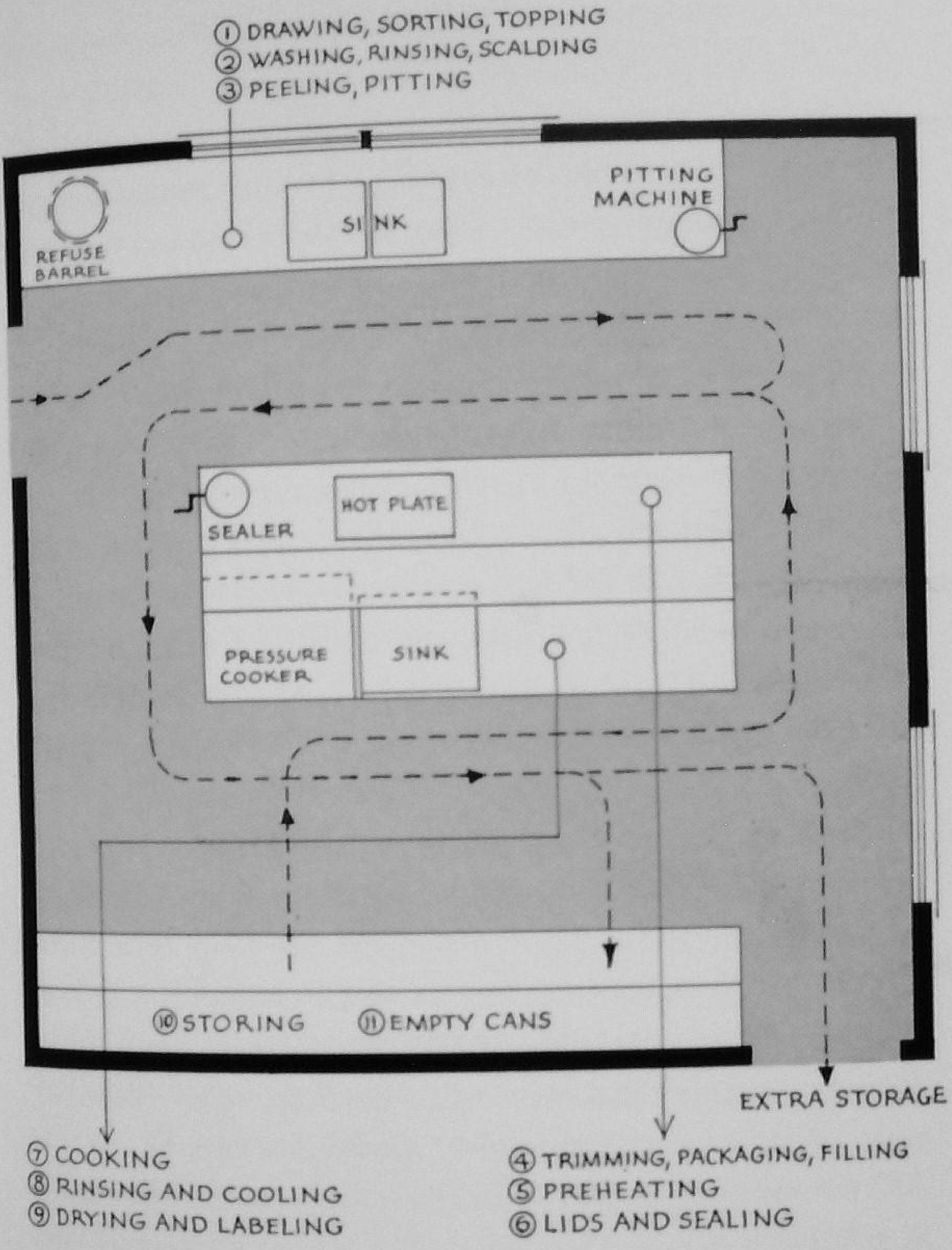
"During the canning season she usually dresses chickens in lots of ten one day and fries them the next, though she has canned as many as forty chickens in one day.

"If the weather permits, Mrs. Peters picks the chickens outdoors. Asked if she had any special short-cuts in singe-ing or removing pinfeathers, she replied, 'I kill the fryers only when the feathers are ripe. I singe over the gas and not a pin feather is left when I get through.' She discards the feathers.

"After she has cooled the carcasses in ice water, she cuts them up and sorts out the pieces into three pans. The fleshy pieces are for frying, the bony pieces for soup. The livers and the hearts, fried separately, will be canned for de luxe markets. After salting the meat, she cools it overnight in the refrigerator. 'The meat must be thoroughly cooled at once,' she declares. 'Otherwise, spoilage occurs.'

"Her canning factory is in the sunny spotless basement of her farm home. Her main cooking equipment is two three-burner gas stoves, which burn gasoline, and a coal range. When asked about the frying heat, she replied, 'After the gas is properly generated, I open the burners up at full speed.'

"Her frying utensils are two pans each 14" wide, by 31"



Courtesy Weyerhaeuser Sales Company

Floor plan for a kitchshop. Note flow of products from entrance to exit

long by 3" deep. Each pan will hold the fleshy pieces of five chickens.

"Chickens Fried in Deep Fat

"She fills each pan from half to three-fourths full of fat. Right here perhaps is one of the several reasons why Mrs. Peters' fried chicken is so delicious: One-third of the fat used is fresh butter, two-thirds of the fat is lard—both lard and butter being made by Mrs. Peters.

"She flours the fleshy pieces in a floury mixture which is one-fourth pancake flour and three-fourths white flour. She uses no pepper.

"One Chicken per Can

"Usually the chicken will brown beautifully on both sides in from twenty to thirty minutes. The contents of each frying pan will fill five of the sterilized jars which Mrs. Peters has ready.

"While the second panful is frying, Mrs. Peters packs pieces already fried into the cans, placing each piece in the can in a regular order, and the gizzard on top. She pours off as much as possible of the fat left in the frying pan and makes a gravy of the fryings, water, and a little salt. This she pours over the packed chicken.

"Mrs. Peters uses No. 3 (quart) tin cans, the weight when the chicken is packed being 2½ pounds or more.

"Next she seals the lids perfectly tight and puts the cans in the pressure cooker. Each of the two cookers which she uses holds ten cans. The fried chicken is cooked for one hour at 15 pounds pressure. At the end of one hour, she removes the cans at once and cools them in running water.

"'If there is any sign of grease after the cans come out of the cooker, I examine the cans for leaks, which very seldom occur. A leaky can will float in the water. The chicken can't spoil if the seal is perfect.'

"Bony Pieces Make Soup

"The chicken necks and backs are stewed; and the meat stripped off for canned chicken soup. At 15 pounds pressure it is processed for one hour. 'I have made some with celery and carrots added,' Mrs. Peters says. 'But my customers liked it best just plain.' Chicken soup cans are the same size as those for fried chicken.

"Mrs. Peters' young 'Roast Duck' is processed the same length of time as the chicken and at the same pressure.

"When asked the secret for her fried chicken's and other product's reputation for being so delicious, she had replied, 'I guess I'm just a good taster; I enjoy my work; put forth every effort to cook tasty dishes—in other words, a "natural born cook".'

"She estimates that it requires two hours to kill and dress a batch of 10 frying chickens, two hours to fry, pack, and pressure cook them, and a few extra minutes for labeling and packing the cans.

"She uses cardboard boxes for sending a dozen or less cans, and wooden crates for a shipment of more than a dozen. Four to six cans are sent by parcel post; one dozen cans by express; and a hundred or more cans by freight.

"Mrs. Peters says she always has secured her markets only by the recommendation of enthusiastic customers.

"Besides operating the canning factory in season, Mrs.

Peters, who is in her forties but doesn't look it, helps her husband milk the cows, takes the children to their rural school when it is in session, and does the usual work of a farmer's wife."

The Kitchshop can be used as an adjunct to more effective living or developed into a business. The products that may be processed would quite naturally be those that were growing on the farm or obtained from others and processed for an already established market. The lists on the opposite page are only suggestive:

The Kitchshop opens up a new commercial field for farm women and their daughters. In the development of special products, emphasis should be placed on quality, appearance, flavor, and the use of special recipes of the kind "Mother used to make." Here is a field in which commercial operations and bigness take second place.

Fruits

Dried
Canned
Frozen
Preserved
Jellies
Jams
Mixtures
Juices—drinks

Vegetables

Canned
Dried
Frozen
Precooked
Soups
Juices

Field Crops

Cooks whole
Cracked
Meal
Flour
Flaked
Mixes
Breakfast foods
Hominy

Dairy

Whole milk (special types)
Cream
Cultures
Butter
Cheese
Combinations
Milk-egg drinks

Poultry

Eggs
Egg preparations
Roasters
Broilers
Fryers
Fried parts
Soups—gravy
Sandwich spreads

Meat—Hogs, Cattle, Sheep

Fresh
Special cuts cooked
Stuffing and dressing
Canned
Frozen
Pickled
Corned
Sausage and mixed meats
Loaves

Miscellaneous

Herbs—flowers
Vinegar
Soap

10. The Farmfac

It is not probable that the time will come when all of the six million farms in the United States will have on them an individual Farmfac (farm factory). There are too many things that can be done co-operatively or more effectively by urban corporations. Not every farmer has the desire or the ability to handle products after they are produced. However, there are those who do, and others will acquire a liking for it, if and when it is better understood and found to be profitable.

Many farm products could be farm processed if they could be successfully marketed. In regions where a single type of agriculture predominates, farmers can individually produce and handle simple processing within a marketing plan similar to that worked out for butter, for example, in one of our more important and successful dairy states. This plan consisted in the creation of a state grading, inspecting, and selling organization. First, specifications were created for the type and kind of equipment that would be required for making the product. The conditions under which the milk and cream were produced and the way they were

handled were all set forth. Inspectors constantly followed up to see that requirements were met. The penalty for violation of prescribed rules was withdrawal of the right to use the trade mark and sell through the sales organization. As the butter was made, it was shipped to customers created by the sales department. The cost of the sales and service organization was borne ratably by all who worked within and marketed through it. The same general idea has been applied to the production and marketing of maple syrup, honey, nuts, and other similar products. It can be easily adapted to a wide range of products.

The individual Farmfac can perform an important function on farms where the yearly labor distribution is unbalanced. Crops produced during the spring and summer can be harvested and processed in the fall and winter indoors in heated buildings. (See charts on pages 00 and 00).

For the farmer who has never done so, it will be interesting to analyze the use to which most of his farm buildings are put. He will find that much of the space is devoted to storage, a very low-value use. He builds a crib or grain bin for grain storage, a shed for machinery storage, a smokehouse for meat storage, and much of the general-purpose barn is used for hay storage. Horse stalls are places for power storage. Storage to the industrialist is a necessary evil. Warehouses filled with products mean heavy inventories, and no manufacturer wants his funds tied up in this manner. He makes his money in his manufacturing and processing plants. That is where the farmer will make his, also, when he understands processing as well as he does production.

On one farm these results were obtained in turning feed into pork. For every dollar of labor used, pork to the value indicated was sold:

Year	*Amount Received for Pork per $1.00 of Labor Used*
1939	$12.00
1940	8.00
1941	11.00
1942	12.00
1943	10.00
1944	18.00

These are good returns. It will be noted that all years except 1939 represent war years. The picture can be materially changed if labor continues to cost more and more and prices of farm products go down. This double squeeze will call for more tools that will take the place of high-priced labor.

The University of Illinois College of Agriculture found on a study of twenty-seven farms in Piatt County, Illinois, in 1937, that $14.61 worth of corn was produced for an input of $1.00 of horsepower (horse and tractor) used. Stating it in another way, 32.8 pounds of product (corn) were produced per horsepower-hour.

Every study we have made shows that the process of substituting mechanical power for man power has been in the direction of increased profit.

It is interesting and worthwhile to make some comparisons between farm and industrial investments. William M. Rand, president of Monsanto Chemical Company of St. Louis, presented some interesting figures at a recent

annual meeting of stockholders. They show in striking manner the degree to which industry is investing in tools, equipment, and materials. It is their answer to the ever increasing wage problem.

Average plant investment per worker from beginning of company to 1946	$9,000.00
Average 1943 to 1946	12,000.00
Average 1946	14,000.00

R. H. Wilcox, a practical and successful professor of farm management at the University of Illinois, has given us the investment breakdown on a Midwestern corn belt farm which may be compared with that of the chemical company:

Items	*Investment per Worker*[1]	
	Industry (Chemical)	*Farm (Midwestern Corn)*
Land	$ 300.00	$28,800.00
Service Buildings	1,500.00	3,500.00
Machinery and equipment	5,500.00	2,750.00
Working capital	4,600.00	1,000.00[2]
Total	$11,900.00	$36,050.00

An effective analysis of the relationship between the farm operator's net income and the way he uses capital is shown in the following figures covering family-operated farms during the period 1930–45, in five different types of farming areas.

[1] These are not average figures for industry or agriculture as a whole. Two illustrations were selected, one being a modern and successful chemical company, the other a successful, two-man, well-equipped, 360-acre corn belt farm.

[2] Mr. Wilcox comments that if operating capital is considered as everything on the farm other than real estate, the above farmer would have $24,000 in operating capital, or $12,000 per worker, consisting of chattel inventory—feed, seed, livestock, etc.

	Kinds of Farms[3]				
	Cotton	*Spring Wheat*	*Dairy*	*Corn*	*Winter Wheat*
Machinery and equipment owned	$ 480.00	$ 1,200.00	$ 1,070.00	$ 1,220.00	$ 1,950.00
Capital used	7,700.00	12,500.00	12,100.00	20,200.00	20,600.00
Value of production per man-hour of labor	0.25	0.69	0.63	0.75	1.10
Operator's net income	1,140.00	1,475.00	1,575.00	1,775.00	2,210.00

These figures suggest some interesting comparisons. It appears that this corn belt farmer spends more to create a job for one worker than the industrialist. The farmer has a heavy investment in land and buildings, but a relatively small sum in tools and working capital. It is probably true that farmers in general are undertooled. As the cost of labor goes up, there must be more and better labor-saving tools with emphasis on more farmstead tools (generally called buildings) that work and become dynamic machines rather than static storehouses.

The farmer of tomorrow will build and operate his Farmfac as the industrialist does his manufacturing plant. Through it he will process the products during that part of the year he is not growing and harvesting them. The crops or stock grown and the products to be made will determine the type of Farmfac to build. A few suggestions for Farmfac processing will give an idea of how this new-old idea in agriculture may became a new reality.

[3] Ronald W. Jones and Wylie D. Goodsett, *Typical Family-Operated Farms 1930–45, U.S.D.A. Bulletin F. M. 56* Bureau of Agricultural Economics (April, 1946), 17.

There is an opportunity for the man who grows crops for livestock to grind and mix many types of feed. In the past we have thought that a ration was balanced and met most feeding requirements if it contained the proper proportion of carbohydrates and proteins. Today we know that other ingredients not only pay but, in many instances, are essential. Vitamins, minerals, vermifuges, and other products just emerging from the experimental laboratory are imparting to feeds new qualities that affect animal health, vigor, reproductivity, and rapidity of gain.

The livestock producer in his Farmfac will grind, crush, and mix these essential ingredients. Overhead bins, elevators, and metering devices for uniform mixing will be parts of his equipment. Grain and finely ground legume hay will play important roles in modern feed formulas. These processing farmers will become keenly alert to the necessity of growing crops on well-fertilized soils and cutting or harvesting them at proper stages to provide maximum nutritional value.

Little time need be devoted to discussing methods which dairy farmers usually follow. A newer phase of processing will someday become a part of the modern dairy farm. One of the most wasteful and absurd procedures related to agriculture occurs in the handling of milk from farm to city home. When the milk is drawn from the cow, it is warm; then it is cooled and put into cans. Cans are picked up and trucked to town. The milk is then transferred to tanks, cooled again, hauled to the city, unloaded at a plant where it is weighed, separated, standardized, warmed

and pasteurized, cooled, packaged, cooled in storage, loaded, hauled, unloaded, and finally left at the consumer's doorstep. The user once more cools it so that it will keep until consumed. Needless to say, this volume of handling and processing adds to costs and hence holds down or decreases use.

The day may not be far off when a substantial percentage of consumers' needs will be met by transferring the warm fresh milk to a separator, then to a drier; and finally, it will be packaged and shipped by parcel post to the city customer, who will purchase a month's supply at one time. The pure fat will go into another container and, with both products on hand, the housewife will always have available skim milk, 4 per cent drinking or cooking milk, 20 per cent cream, or any other proportion desired. This short-cutting of city ordinances, heavy labor charges, and multiple processing and handling bids fair to revolutionize the dairy business. It should also increase the use of milk, thus contributing to better health and increased farm profits.

Other attractive new processes are in sight for the dairymen of tomorrow, such as high-vitamin milk, drink combinations, special spreads, and dried whole milk.

Trees ripen and should be harvested when mature just the same as corn or wheat. Their uses are multiplying rapidly. One use for a Farmfac will be to work tree crops into small farm buildings, farmyard furniture, and home improvements. Equipment for efficient wood-processing was available before the war. Added to old lines will be machines for treating wood to make it almost as hard as steel, as resistant to moisture and insects as concrete, and

as pliable as wire. Waste parts can be compressed into wallboard and thin sheets made into plywood.[4]

Not only will the woodlot furnish raw processing material, but the strawstack and stalk fields will make their contributions. Experimental work is almost completed for making straw into building sheets on a farm or community basis.

With modern methods of poultry and poultry-product production well understood, many farmers are now taking up the next step—processing. Pasteurizing of whole fresh eggs is a proven process. E. M. Funk, professor of poultry husbandry, College of Agriculture, University of Missouri, has worked out a process for improving the keeping qualities of eggs. He wrote me recently:

"It has been found that by heating shell eggs for a few minutes at 130° to 140° F. the fresh appearance and edible properties of such eggs are maintained to a remarkably high degree and far better than by any process used to date. The process accomplishes the following very desirable objectives:

"1. It stabilizes the thick albumen so that the egg retains its fresh appearance for a much longer time under adverse conditions than eggs which are not treated.

"2. It devitalizes a fertile egg so that it reacts thereafter the same as an infertile egg, all chick or embryonic development being prevented.

[4] Publications of the Forest Products Laboratory, Madison, Wisconsin, show improved methods for processing and handling wood.

"3. There is a pasteurizing effect against the organisms that cause spoilage in cold storage and therefore the keeping quality of storage eggs is improved.

"The process is most effective when combined with oil processing. A procedure which gives excellent results is to immerse clean, sound shelled eggs in water held at 130° F. for sixteen minutes and, after drying, dip in regular egg processing oil. Such eggs possess the desirable qualities listed above and the protection against evaporation which oil processing provides."

Dressing and freezing of chickens will be done on many farms, making them ready for hotels, restaurants, and private consumers. Turkeys and ducks are in many instances, made a part of the same processing procedures.

The Farmfac makes farming more secure than it has been in the past. It will make a place for that son who wants to stay on the farm, but, in the past, has felt that the old farm was not large enough for both father and son. If he does remain, he will not long be satisfied to do little more than follow the plow.

I had finished a speech on vertical farm diversification when a young man came up to me and said: "We have been considering doing just what you talked about. We have made a start, but feel the time has come to develop our program farther. Will you send a man to our farm, make a study of our situation, and then propose a plan for complete vertical farm diversification?" This offered our first opportunity to make a complete farm program along

vertical diversification lines, although we had for many years practiced it on farms under our management.

Henry C. Eckert settled on a 110-acre farm in St. Clair County, Illinois, in 1877. His main crops were wheat, corn, and hay. In those days the gross farm income for a year could not have been much more than $1,200. Since that time his son, Alvin O. Eckert, and Alvin's three sons, Cornell H., Curt E., and Vernon M.—all University of Illinois men—have seen the acreage grow to 914, and the gross income multiply at least two hundred times.

Not all of this has come from the sale of raw farm products. The decision to make of the farm something more than a crop-producing unit was reached when Curt came home from the agricultural college. He told his father that he had been offered a scholarship at another university and felt he should take it because "it doesn't seem to me that there is room for you and us three boys on the home farm."

"Curt, you do what you think is best for your future, but if you want to come back here and work with the rest of us, *we'll make room for you,*" the wise father replied.

That was in 1930. Farm expansion in terms of more acres often takes years and may never be possible, but expansion upward—vertically—can always be accomplished without waiting.

In 1900 a twenty-acre orchard had been started. It was coming into bearing when the boys were old enough to help care for it and sell the fruit. From the beginning an effort was made to attract buyers from the near-by town of Belleville. Farm dooryard sales were supplemented by sale from a team-drawn wagon to town merchants.

In 1924 a paved highway went through the farm. The first roadside market was built in 1924, right after the road was completed. A new roadside market was built seven years later. This helped sales, but still it was necessary to deliver to local merchants.

Now the original five acres of peaches has grown to almost two hundred and the fifteen acres of apples to more than three hundred. Much of this acreage is not yet in bearing, but 22,000 bushels of peaches and 25,000 bushels of apples have been sold at the farm roadside. More than 1,500 people drive to the Eckert orchards in a single day. On occasion it takes more than two hours to get through the line of waiting purchasers.

Tree-ripened Elbertas have made the Eckerts famous. Modern orchard care and careful picking and packing of full-ripe peaches have resulted in a product that sells independent of commercial markets. During the war the demand could not be met at $4.00 and more per bushel.

The sale of peaches, although spread over a longer than average season from the last of July to the middle of September by virtue of growing a number of different varieties, and apple sales, from September to May, still left the business somewhat unbalanced.

It was at this point that we were asked to make a study of the entire business and offer a plan for:

1. A better labor balance throughout the year.
2. Additional sources of income.
3. Spreading risk over additional activities.
4. Stepping up processing to bring it into balance with production.

5. More products to sell to customers who now came only for fruit.

The over-all plan is not yet in full operation. That part which has been undertaken has met all the difficulties of postwar expansion.

The roadside stall is now a modern store, containing 4,-000 square feet, with 300 feet of shelves. A complete line of all kinds of food products is carried. The customer who formerly came only for fruit can now fill the market basket as completely as in any modern chain market. Of course, the Eckert home-grown and processed products are featured. They are:

Fresh peaches and apples in season.

Apple juice, butter, and sauce.

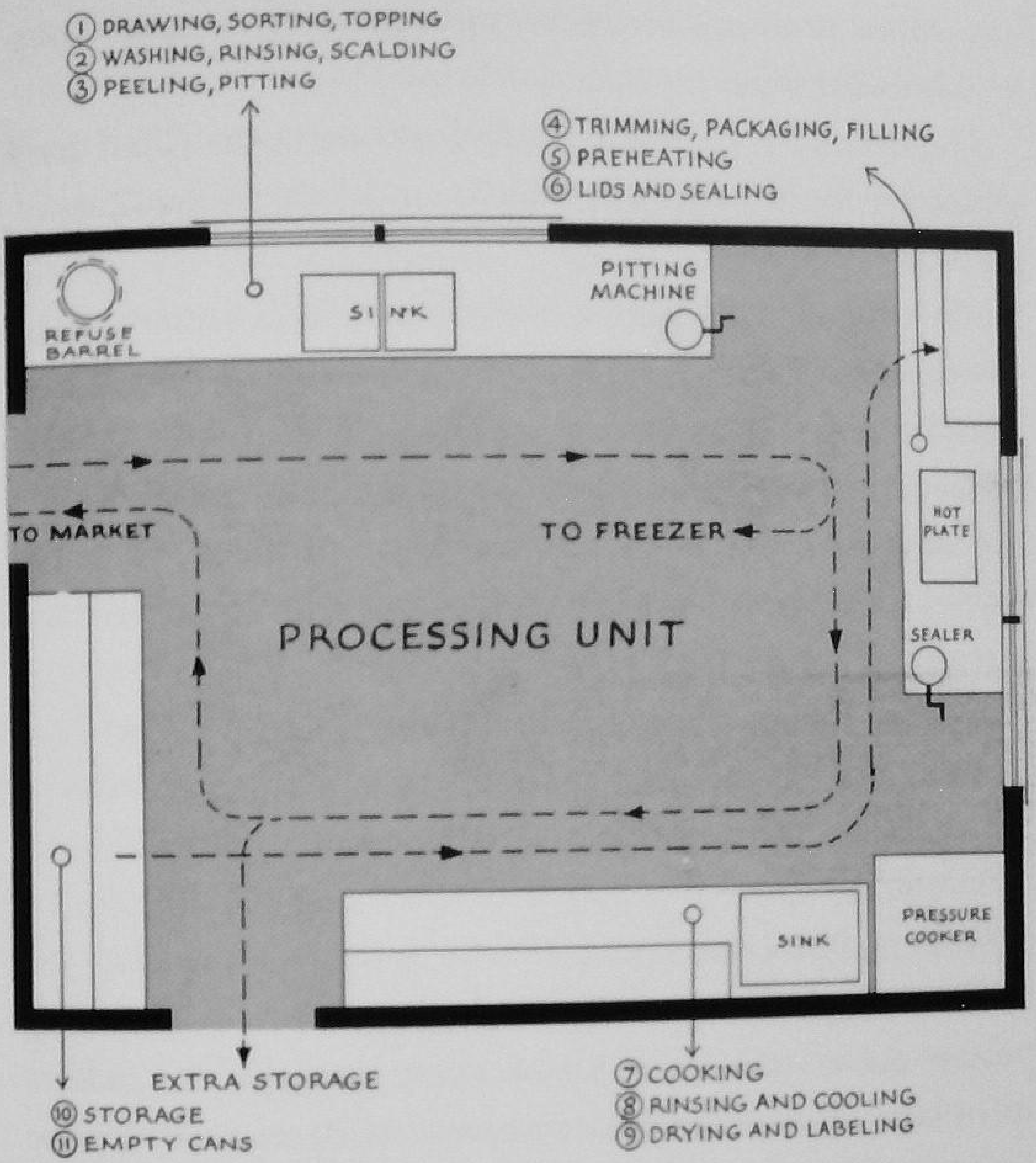
Canned and frozen peaches, and peach preserves.

Sorghum.

Fresh and processed pork.

The Eastern Regional Research Laboratory perfected a process for making a superior apple juice. Curt Eckert spent some time at the laboratory and with successful juice makers using the government process. He came home and built a brick and tile unit containing modern stainless-steel equipment. It has a small control laboratory and is capable of turning out 1,000 cases of one-quart bottles of apple juice a day.

The canning of fruit and the making of preserves are handled in the same building. Greatest care is used in selecting and handling the fruit. It is probable that these products will soon push beyond sales through the Eckert store. In fact, plans for wider distribution are now com-



Courtesy Weyerhaeuser Sales Company

A farm home-processing room which utilizes only the wall space. Products flow naturally from farm to market

pleted. A modern cold-storage plant and deep freezer are used for freezing fruit and carrying apples so that they can be sold throughout the winter.

In 1947, a new and modern slaughterhouse was completed. It will handle fifty hogs a day. Plans call for no more killing than can be retailed through the store. Hogs are killed as used so that fresh pork is always available. Country cuts of "backbone and ribs with meat on them" are featured, also sugar cured hams. Hickory and applewood are used for smoking bacon, hams, and sausage. The processed meat consists of fresh and smoked blood, summer and mett sausage, and head cheese.

Careful records are kept on breeds of hogs killed. Age, weight, and method of feeding are also studied. The object is to turn out the best pork and pork products that can be produced. Plans are on foot to work with hog producers so that desirable carcasses can be obtained and a premium paid to the grower.

Each of the brothers carries a major responsibility. Cornell is the farmer. He handles all the land and cares for the orchards, harvests the fruit, and delivers it to the store.

Vernon is in charge of the packing plant and store. He does the buying and selling.

Curt produces or buys the livestock, any fruit needed beyond the production of the farm, handles all the processing, and keeps the books.

Alvin, the father, as one of the boys said, "keeps us going and helps us when we need him." Evidently the boys get along quite well now, for Father and Mother Eckert have just returned from a three weeks' trip to Guatemala

where Mr. Eckert went to examine farming conditions in Central America.

Alvin Eckert has been a wise father in turning responsibility to his boys and then letting them work out their problems. He has stood by ready to help when needed. All the boys (two are married) and the parents live on the farm. The family, working together, has developed a fine business. The early promise of Mr. Eckert, that he would make a place for each boy if he chose to return to the farm after he graduated from the university, has been kept.

As viewed from the outside, the whole program seems to have but started. The Eckerts are good businessmen. They get outside technical advice when they need it, and then they push ahead in a businesslike way in actually carrying out sound recommendations.

Not all of the five original objectives have been attained. During the last two years expansion has been difficult and slow, but the goals are in sight.

Mr. and Mrs. Alvin Eckert have not only demonstrated how a farm business can be made to grow and expand profitably, but, what is equally important, they have demonstrated that vertical farm diversification keeps boys on the farm.

There are many steps that may be taken between the production of a farm product and its delivery to the consumer. Here are some of them:

Crops

- Cleaned
- Graded
- Treated
- Dehydrated
- Ground
  - Cracked
  - Meal
  - Flour
- Mixed feeds
- Mineral feeds

Timber

- Lumber
- Finished millwork
- Window sash
- Doors
- Furniture
- Stock equipment
  - Troughs
  - Racks
  - Feeders
  - Small houses
  - Handles

Fibers

- Ginning
- Storing
- Bagging
- Carding
- Spinning
- Weaving

Miscellaneous

- Syrup
- Flowers
- Herbs

Vegetables and Fruit

Shown under "Kitchshop," Chapter 9.

Stock

- Fattened
- Butchered
- Fresh meat sold
- Canned
- Frozen
- Processed
  - Sausage
  - Loaf
  - Corned
  - Pickled
- Tankage
- Specialty products
  - Casings for sausage
  - Hides
  - Leather
- Wool
- Mohair
- Bristles
- Poultry
  - Roasters
  - Fryers
  - Eggs and products
- Dairy
  - Cream
  - Butter
  - Cheese
  - Drinks
  - Mixtures
  - Dehydrated

11. Co-operation and Vertical Farm Diversification

MANY FARM WOMEN and their daughters are making a success of vertical farm diversification through their Kitchshops. Some are handling all three steps—production, processing, and selling. More would undertake the first two if they could become a part of a satisfactory marketing program.

More and more farmers are working out successful production and processing plans. They are balancing the labor load more evenly throughout the year and turning idle hours into productive days. Sooner or later, however, they encounter that ever present problem of marketing. They could step up production and processing if they could sell. In some cases it is purely a matter of time. After they have completed the farm jobs, they do not have time to sell and deliver to the logical purchaser or ultimate consumer.

There are those who say that only large farm operators can handle vertical farm diversification. Before discussing the problem, we must have a better definition of small and large farms. Clearly size is not based on acres, and volume of business has its limitations. From my experi-

ence, I can say that I have yet to find a farm that is too small or too large to undertake some phase of vertical farm diversification. Size of farm is not a qualification for carrying farm products one or two steps beyond raw production.

Marketing and Selling Are the Main Problems

Most manufacturers could expand production if they could sell their product. The farmer who sells only raw products has his marketing problems also. There is no way to dodge them. The operator who contemplates any change in farm plans should be certain that he can arrange an adequate selling program before he undertakes the new plan.

The best solution to the problem of marketing farm products that has yet been found is the farmer-controlled co-operative.

Co-operation may be a very simple undertaking. Two neighbors may join to buy seed or ship a load of hogs. On the other hand, it may be extensive and involved, including every step from planting or pruning in the spring to getting the product on the consumer's table, as is done by some of the citrus co-ops. Over 50 per cent of the farmers of the United States are a part of some co-operative organization. They have joined forces to carry insurance, erect telephone and electric lines, run a combine or threshing ring, hold sales, organize soil-conservation or irrigation districts, and so on through a long list of economic as well as educational and religious activities. They handled through their buy-

ing and selling associations over eight billion dollars' worth of products in the 1947–48 season.[1]

All too many think co-operation among farmers relates only to big buying, selling, and processing associations or activities sponsored by some state or governmental organization. Farmers have successfully co-operated in the United States for over one hundred years. Laws have been enacted that recognize and legalize their activities. Those who would fight the co-operatives would do well to make certain just what features are wrong and then ask if it would not be better to spend their efforts in removing the inequities in nonco-operative laws rather than condemning the organizations because they are working within a law that not only is fair to them, but would be equally fair to others if made to apply to both groups. Some co-operatives are made up of small farm operators, while on the other hand one of the largest farm operations in the United States is a part of, and loyally supports, one or more farm co-operatives. None is too small to be welcome, none too large to benefit.

If some undertaking beyond raw production is contemplated, certainly one of the early considerations must be whether it can best be done individually or co-operatively. This decision should be approached with an open mind. If all that is necessary is to make the decision, being assured that either route is open, then it should be made on the basis of true merit. One point is definite and clear, namely, that when a project appears to have sufficient merit

[1] Co-operative Research and Service Division, Farm Credit Administration, U.S.D.A., news release, August 30, 1949.

to justify its adoption but lacks only volume of product, then co-operation is generally the answer. Let us examine, step by step, the relationship between vertical farm diversification operators and the co-operatives.

1. First, there may be a group of farmers who grow and process, on their own farms, a given product. Demand for it is good, but there is complaint among customers that the product is not uniform. Such a group could co-operate in employing or obtaining, through their county agent, someone to teach them the best way to make or handle the product so that all producers come up to the standards of the best.

2. A second step would be to have the grade instructor take over certain phases, if not all, of the advertising and marketing. There are those who tax each unit of their product for a co-operative advertising campaign, which ends by saying: "Buy this product direct from any one of our members whose names and addresses are . . . ." Or all selling may be done through one agency.

3. If processing and selling have been solved, perhaps certain supplies can be purchased co-operatively, such as containers, labels, equipment, and various ingredients. Labor might be employed that would go from one producer to another during periods of peak operations.

4. The smallest practical units of some types of vertical farm diversification are still too large for the average farmer of a community. In this class are gins, elevators, canneries, locker plants, dehydrators, creameries, and cheese factories, to mention but a few.

The Rochester Dairy Co-operative, with headquarters at

Rochester, Minnesota, whose founder and manager is J. M. Punderson, is a good example of what can be done by a large group of small operators. Within four years it has raised its volume to one million pounds of milk a day produced by 4,400 member farmers—about 230 pounds of milk per producer. The company has a three-point, long-time program of (a) high quality, (b) service to patron and customer, and (c) diversification of products and markets. In this last field it produces between twenty and thirty different products, such as fluid cream, evaporated milk, condensed milk, sweetened condensed milk, non-fat dry-milk solids, whole-milk powder, dry ice-cream mix, regular ice-cream mix, fluid milk, butter, concentrated cream, cottage cheese, and a number of other items.

Here indeed is vertical farm diversification beyond the ability of one producer, but made possible by more than 4,000 dairymen joining together to carry their products beyond raw production.

As vertical farm diversification grows, an increasing number of new operations will make their appearance. Rather than describe each individual product that might or will be made, let us discuss them by class or type of process. There are those who will say that the list is visionary and impractical. Frankly, some are described that are not now in operation. There are others that have never been undertaken, as far as I know, as small farm or community plants, although large industrial units have long been established. Perhaps we should say the list includes all groups from those which are immediately practical to others which are only in the dim future.

I. *Extraction*

The extraction of oil from oil-bearing seed can be and is as widespread as any other process in the United States. Flax extraction in the Northwest, peanuts in the Southeast, tung in the Gulf area, cottonseed throughout the cotton belt, soybeans throughout the corn belt, and fruit and nut products on the Pacific Coast just about give national coverage. In addition, there are minor volumes of castor, sunflower, perilla, and, of course, oil from grain crops such as corn and wheat.

Vegetable oil is a product that we will not easily overproduce if the American farmer can have his home market for his American-grown products. Before World War II we were importing, in round figures, nearly two billion pounds of vegetable oil a year. It is the foreign product constantly hanging over the American market that is a major factor in keeping it on the ragged edge of small or no profit.

One of the reasons that farmers who produce oil and high-protein crops should be interested in their processing is the fact that they, the producers, are also the consumers of a large part of the product. Most of the soybean, flax, and cottonseed meal goes back to farmers either directly or indirectly as stock feed. Farmers also feed cottonseed hulls. To the degree that they buy paint, they are the market for their own flax and soy oil. In the area of refined products, they are large consumers of vegetable shortening.

With the coming of solvent extraction and the perfection of small farm and community units of other types of extracting machinery, there appears to be little reason

why farmers should not undertake this step of processing. The small solvent plant being perfected at the Iowa College of Agriculture at Ames has a capacity for handling about one township of bean production. With such a plant the average haul to market would be less than four miles. The producer-consumer could haul his beans to his own mill, haul back his meal and as much of his oil as he needed for paint. There is now on the market a 100 per cent soybean-oil paint which dries satisfactorily. The farmer buys the paste which contains the dryer, then mixes one gallon of it with one gallon of the raw oil just as it comes from the mill. This gives him two gallons of pure, undiluted, no-filler paint of the best grade on the market at, before the war, about half-price. Perhaps someone will find other farm uses for soybean and cottonseed oil which will further extend the direct farm market for these products. It would seem that oil extraction is one of the more promising undertakings for farmers.

In 1920 the Simonsens brothers of Quimby, Iowa, bought a farm some two miles from town. They handled hogs and cattle, bought corn and concentrates, and wondered why they paid so much more for the meal than the price of beans indicated they should. Years later they started a rendering plant to make tankage. In 1937 they put in a single-unit expeller for handling soybeans, a crop they helped introduce into their area in 1936. They have continued to add extracting units until now they have four and produce over 10,000 tons of meal a year. They have expanded operations by mixing concentrates such as soybean meal, linseed-oil-meal tankage, alfalfa, and minerals, and have

developed an excellent business in oil extraction right on their farm, where their neighbors are their two-way customers, and the steps from production to processing and selling are perfect illustrations of vertical farm diversification at work on their Farmfac.

II. *Dehydration*

Dehydration received a big boost during the war. Some of it became a necessity to conserve space in ships and supply trucks serving combat forces. Some of the foods dehydrated for soldiers will not find profitable postwar civilian markets in competition with fresh, canned, and frozen products. Nevertheless, dehydration is a rapidly growing industry, and it will play an increasingly important part in vertical farm diversification. The future will in all probability make wider use of freezing and chemicals as dehydrants. Engineers and chemists now tell us that our present methods of directly applying heat for removing moisture is woefully inefficient. This being the case, these new methods should open many possibilities in this field.

Drying of whole milk is just getting started. Farmers with medium-sized herds could use small plants for drying milk just as it comes from the milking barn. It could then be shipped direct to customers by parcel post or delivery truck and thus save hauling 87 per cent of the product—water—together with the excess bottles, crates, and ice that often equal the whole milk in weight.

New and increased volumes of old products are found in alfalfa, buckwheat, and some other crops when dehydration methods are varied. Unquestionably, many medi-

cal and health-restoring products will come from crops we now call livestock feed.

Ruten is a medicinal product that the Eastern Regional Research Laboratory has found in buckwheat. It is used for relieving certain types of high blood pressure. The buckwheat is cut soon after blooming, dehydrated, made into meal, and then extracted. The extraction process is not well adapted to farm operations, but the production and dehydration of the crop will be a new farm or community process.

B. G. Perkins, one of my associates, has designed "the crib of the future". Excess moisture is removed from the grain stored in it by simply forcing air through the crib and grain. This combination storage-drying unit can be built for about 50 cents a bushel of ear-corn capacity. It illustrates a fully practical drying unit for all types of farms producing corn, small grain, or hay.

The extraction of water from fruits and fruit juices may well be a process that will dominate some of our major industries. The concentration of orange juice down to one-seventh of its normal volume should play an important role in the citrus industry. Both heat and freezing are being used successfully.

A new method for preserving foods is being worked out at the Western Regional Research Laboratory. It is called "dehydrofreezing." L. B. Howard and Horace Campbell have this to say about it:

"Preliminary experiments with several fruits and vegetables have shown that moderate dehydration (removal of

about two-thirds of the water content) followed by freezing resulted in excellent products in most cases.

"Benefits of dehydrofreezing are:

1. Products are easier to 'reconstitute' than if dehydrated.

2. Weight and volume are less than with conventional freezing.

3. Substantial economies are effected in packaging materials.

4. Partial dehydrating reduces load on refrigeration system.

5. Certain commodities yield products which are superior to those obtained by freezing alone.

6. High altitude freezing of foods sent by air may be practicable if dehydrofreezing is employed."

Those contemplating the establishment of dehydration operations should study modern methods and the end products obtainable very carefully before purchasing equipment. This whole industry faces a revolution.

III. *Digestion*

The consumption of paper in the United States has increased at the rate of about 250,000 tons a year. Present consumption of paper-making material, especially trees, is already at a point that threatens our available wood supplies. We will soon be consuming between ten and twelve million tons a year. Formerly we imported large quantities of wood, wood pulp, and paper from Canada and the Scandinavian countries—sources which may be available to us in limited quantities, if at all, in the future. America must produce and save her own cellulose. The only large

sources of unused cellulose are the straw and stalks of such crops as corn, cotton, and beans. Wheat, oat, and rice straw are now being used.

Some phases of the paper business had their beginning in rural areas, where the farmers made the "soup"—digested the straw in large kettles—and then after separation shipped the cellulose to the paper mills. This practice can be revived. Small modern digestors may take the place of the kettles. They can be installed in rural areas close to sources of straw now often burned. The cellulose, which is for the most part sunshine, air, and water, and constitutes about half the total product by weight, would go to the mills. The lignin containing the vegetable matter and minerals would remain in the country to go back on the land where it is needed instead of into streams which it now pollutes.

This phase of vertical farm diversification deals with one of the most important problems of American farmers—the utilization of farm products now called waste. In the stalk and cob of a corn plant there is about one-half of the total nutrient value of the crop. Similar proportions are found in other major crops such as wheat, oats, and some fruits.

Let us examine the growth character of a grapefruit tree. During a single season it makes its annual wood, leaf, and bloom growth. The total of this can only be guessed. A fair yield of fruit would be 400 pounds per tree. Fifty-five per cent of this is peel, seed, and rag, leaving 180 pounds of juice. The juice is about 12.5 per cent solids or 20 to 25 pounds of digestible nutrients per tree. This is the number

of pounds of food which we use from the total annual growth of the tree, not counting the drop of green and ripe fruit, handling wastage, and other similar losses. If the wood and leaf growth equal the fruit growth, then out of 800 pounds of total tree growth, we actually use say 20 pounds or 2.5 per cent, a rather small part of the tree's total annual production.

One division of the Northern Regional Research Laboratory at Peoria, Illinois, headed by E. C. Lathrop, is devoted to finding additional uses for what we have been calling the waste products of agriculture. Developments from this laboratory will play an important part in the future of vertical farm diversification.

IV. *Refrigeration and Quick Freezing*

There are those who think that quick freezing points the way to stabilizing and removing the hazards from the production of perishables.

E. W. Williams, publisher of *Quick Frozen Foods* trade magazine, estimates frozen foods will eventually represent 35 per cent of the retail food trade and gross six billion dollars annually, in comparison with 300 million in 1946. So far, 345 foods have been packed, 20 per cent commercially, including 44 vegetables, 51 fruits and berries, 65 fish products, 41 meat, and 69 cooked and prepared dishes. Garden peas are most popular and the much maligned spinach is second. At present over twenty-five million gallons of frozen orange juice are being produced. This is a product almost unknown five years ago outside of experimental laboratories.

As previously indicated, the selling of perishables entails many hazards. Any process that eliminates the necessity of accepting an immediate and inadequate price for these products because of inability to hold them will be a boon to the industry. Freezing offers an opportunity for branding and labeling that will carry the name of the producer from the farm to the kitchen. It will also bring on the market many superior products that heretofore have been unavailable because of poor shipping qualities. Some of the finest fruits and vegetables ever produced by the plant breeder have never found their way to commercial market simply because they were poor shippers. Fruits and vegetables can now be harvested at the peak of their fresh goodness, frozen, and delivered to the housewife with a flavor previously lacking. Some products picked prior to maturity have almost no flavor at all. Now quick freezing will take the place of green harvest and artificial ripening.

Farmers who install quick-freezing units should study modern methods which include handling, packing, and storing as well as freezing. In the end the high quality of a branded product and the ability of the producers to process at low cost will be the deciding factors.

Some areas have been left out of profitable markets because of long time-consuming hauls. They may now come in as competitors through quick freezing and dehydration. For most products there is one best area—the center of production. When this is once established, it will dominate the trade and set the pace. It will be that area where the highest quality can be grown, packed, and delivered for the least cost.

Courtesy Production and Marketing Administration

U. S. Department of Agriculture

Corncobs being delivered to the storage bin at the Synthetic Liquid Fuels Semi-Works plant. The cobs are whole or broken just as they came from the sheller at the farm

V. *Distillation*

There is no community processing that would have as great an influence on agriculture as the establishment of plants for distilling industrial alcohol from waste farm products or crops grown for the purpose. This one enterprise would absorb as much surplus corn and wheat as we have ever had at one time if only 10 per cent of the gasoline now being used was displaced by alcohol.

This is a subject on which much has been written. Congress has made extensive investigations, and heated arguments have developed between the "pro" farmers and the "con" oil interests. The subject is much too long and complicated for discussion here. I have followed the matter rather carefully and hold the opinion that the farmer will ultimately find a way to grow at least his own power fuel. By the end of another decade horses and mules as work animals will have almost disappeared. The internal-combustion engine will be a great consumer of corn and potatoes, both white and sweet, when the farmer decides "to grow" his own gas.

Perhaps the future will bring forth small farm stills, similar to those used in Germany before the war, into which can be dumped waste fruits and vegetables, damaged grains and marketable crops, when a small surplus lowers the price of the entire crop. Under government supervision and seal these stills could be periodically emptied and the unrefined product taken to a centrally located refinery where the fuel alcohol would be made. The farmer would be the principal user of his own products. The mash would remain on the farm as a feed for livestock. Fuel alcohol

holds the key to the threat of overproduction, a diminishing supply of petroleum, and the restoration to the farmer of what has been the loss of his biggest single market—horse and mule feed formerly grown on fifty million acres of land.

This production of fuel alcohol by farmers may be nearer than some have suspected. A recent release from the Department of Agriculture, Northern Regional Research Laboratory at Peoria says:

"A process for the chemical conversion of such agricultural residues as corncobs, sugar cane, bagasse, peanut shells, flax shives, oat hulls, and cottonseed hulls and burs into liquid motor fuel and other commercially valuable products is moving into the semi-works stage of experimentation.

"Results of experimental laboratory investigations indicate that from 90 to 95 gallons of liquid motor fuel can be obtained from a ton of corncobs or cottonseed hulls and that about half of this is in the form of ethyl alcohol.

"About 200 million tons of farm waste are produced each year. Much of this is plowed back into the soil to help maintain fertility and prevent erosion, but it is estimated that something like 100 million tons may be available in this new process for the production of liquid motor fuels. Corncobs will be the first of the so-called waste materials to be processed in a new semi-commercial plant to be constructed on the grounds of the Laboratory."[2]

[2] "New Synthetic Liquid Fuel Plant in Operation," U.S.D.A. Agricultural Research Administration Release 2347–46, October 25, 1946.

One of our large industrial organizations has done a great deal of work in turning farm products into farm power. They have worked out a continuous process for making fuel alcohol, and have completed the designs for farm and community plants. They are now running tractors on the products from these small stills.

There are three major factors constantly at work that will decide the question of when farmers will produce their own power. They are growing scarcity of petroleum and consequently higher prices for gas; lower prices for farm products if and when we again have surpluses; and more knowledge of the best way of producing alcohol. A slight adjustment in the design of engines might make it possible to use a crude form of alcohol. Don't jump to conclusions too soon, but keep a watchful eye on the future of farm-produced farm power.

VI. *Compression*

One of the essential steps in gathering and transporting low-valued products from farm to factory is more efficient compression. We need machines which will do the job for less money and develop compression to at least double that which can be obtained with a hay baler. This will make it possible to handle products more economically, store them in less space, and ship them farther at less cost. It is probable that compression machines can be built for turning a straw pile into wallboard.[3] We now have extremely high-density machines for compressing waste wood products into briquettes, making them available for fuel.

[3] The Northern Research Laboratory has a bulletin on this subject.

Ten to fifteen million bales of cotton are compressed to a low density at the gin—eleven to fifteen pounds per cubic foot—then shipped to compresses and warehouses where they are either compressed to standard density of twenty to twenty-five pounds for domestic shipment or to thirty to thirty-five pounds for export. The government Gin Research Laboratory at Stoneville, Mississippi, has developed a gin compress which delivers standard density. This makes it possible to load a full car of cotton direct from the gin.

A twelve-million-bale cotton crop carries a compression charge of about five to seven million dollars. When the farmer compresses his own cotton, certainly there is little reason why he should not also store it until it is ready for delivery to the mill. Some plan for bonding and sampling will have to be worked out to go along with farm storage, but these are simply details. The cost of storing and insuring one crop of cotton has been estimated at $3.00 a bale.[4] This would add twenty-five to thirty-five million dollars to the compress charges, making the cost to cotton farmers, for these services, nearly forty million dollars a year.

VII. *Fabrication and Fiber Separation*

Cotton farmers in 1937 found it difficult to translate their late cotton worth about 5 cents a pound into overalls selling for 75 cents to $1.00 a pound. The result was that some cotton was never picked that might have been saved, and certainly many cotton growers went without clothing they needed badly.

[4] Howell, *Marketing and Manufacturing Margins for Textiles, U.S.D.A. Technical Bulletin No. 891* (March, 1945), 33.

No crop has gone more completely than cotton from the hands of farmers, who were at one time 100 per cent growers and processors, to industry, which now does all the spinning, weaving, and garment making off the farm.[5] The time is ripe for the producers to take back some of their early-day processing and cloth making. The need for garments and commercial cloth was seen on one plantation and a search was begun ten years ago for a small community processing plant. None was found in the United States, but in Stratford on Avon, England, a completely integraded and balanced set of machinery was located, which ran in sizes from ten to forty spindles. It carried the fibers from opening through carding, spinning, weaving, dyeing, and garment making. The war stopped manufacturing by these little plants, but they or others will some day be available again.

The separation of fibers from their natural plant-stem bundles, as is done in retting flax and hemp, and the carding, spinning, and weaving of cotton and wool are natural and logical farm and community enterprises. Certainly the degree to which farmers can process their own fibers into their own needs is worthy of serious study. If cotton farmers made from their own crops all the cotton they do or could use, a very considerable portion of each bale would never leave the plantation or community where it is grown. The poundage of cotton that goes into sacks for seed, feed, and cotton picking, the wrapping of cotton bales in cotton, the making of tarpaulins, certain portions of the gear for

[5] The most recent figures indicate that the cotton farmer gets about 7.5 per cent of the consumer's dollar for his raw cotton.

TABLE 3

Quantities of cotton which would be consumed in various items on the farm under certain assumed conditions[1]

Item	*Number of Units*	*Weight Pounds*	*Non-Cotton Content Per cent*	*Cotton Content Pounds*	*Processing Loss Per cent*	*Raw-Cotton Equivalent Pounds*	*Raw-Cotton Equivalent Per cent*
Patterns for baled cotton	2,500	11,250	0.0	11,250	15.00	13,236	46.0
Picking sacks	500	1,280	5.0	1,216	15.00	1,431	5.0
Bags for cottonseed and other seed	19,548	9,123	5.0	8,667	15.00	10,196	35.4
Tarpaulins	25	575	0.0	575	15.00	676	2.4
Sets of plow lines	300	511	0.0	511	19.00	631	2.2
Back bands	300	112	6.5	105	15.00	123	.4
Work shirts	1,500	938	5.0	891	17.48	1,080	3.8
Overalls	750	1,170	8.5	1,071	23.18	1,394	4.8
Total raw cotton equivalent used on farm						28,767[2]	100.0

[1] Southern Regional Research Laboratory, March, 1947. Taken from a table specially prepared at the request of the author by R. J. Cheatham, head of the Cotton Processing Division.

[2] Or 60.2 bales (500-pound, gross weight). This is equivalent to 2.4 per cent of the 2,500 bales produced on farm.

mules, and perhaps the coarsest portions of clothing—denims for plantation workers, for instance—represent large volumes of cotton. It would be from 2 to 3 per cent of the production on some plantations. Now that safe and dependable means for fireproofing cotton for insulating purposes have been commercialized, there are opened up still greater fields for cotton processing on the farm and in the community.

Through the courtesy of Mr. R. J. Cheatham, head of the Cotton Processing Division of the Southern Regional Research Laboratory, I have been given the figures which follow. [Mr. Cheatham is an experienced cotton technologist and is highly esteemed by members of all branches of the industry from growers to spinners. His figures are estimates, but they show the degree to which the farmer may become his own market for a portion of his cotton.]

The assumptions which we set forth were:

A plantation producing 2,500 five-hundred-pound bales of cotton, having 150 families, 500 total worker population, and 150 mules.

Wrap all cotton bales in cotton.

Provide 500 picking sacks.

Sack three-fourths of all cotton seed and 1,000 bushels of other seed.

Use twenty-five tarpaulins a year.

Two sets of cotton lines and two back bands for each mule.

For each family provide the equivalent of ten heavy shirts and five pairs of overalls.

VIII. *Grinding and Crushing*

The profitable making of plastic flour, cleaning materials, and fillers for commercial feeds and fertilizers is dependent upon a more efficient system of crushing and grinding waste farm products. Experimentally it has been shown that finely ground corncobs make an excellent filler for plastics. Coarser portions can be used with an air blast for cleaning carbon from motor cylinders and tile surfaces that would be injured by the use of sand.

Furfural is a chemical extracted from corncobs and oat and cottonseed hulls. It in turn enters into other industries. There is a maplelike flavor which may be extracted from cobs that should have a commercial application.

Mr. Wheeler McMillen, editor of *Farm Journal and Farmer's Wife,* mentioned in his personal column some months ago that he had heard as a boy about making maple-flavored syrup from corncobs, but had never learned just how to do it. Responding to that note, he received many recipes. They were tried out in the *Journal's* test kitchen and this one was selected as easy and satisfactory:

"Break into small pieces about two dozen corncobs. Place in kettle, cover with water, and boil two hours. Keep cobs covered with water. Remove cobs, strain liquid, then boil down to half. Add one cup of sugar for one cup of liquid. Boil down to thickness desired. Add pinch of cream of tartar."

Why not add this maple flavor to corn syrup and have maple corn syrup?

The new mills that are coming on the market will make it easier and less expensive for farmers to crack and grind

their grains, and make meal and coarse whole-grain flour and breakfast foods. When such crops as corn, wheat, and rye are consumed soon after they are ground into meal or flour, they have a superior flavor not possible to retain for long periods after grinding.

IX. *Concentration*

Industrial users of farm by-products such as straw become interested in it only when they find it in relatively large concentrated piles. The strawstack resulting from old-time threshing methods played an important part in the creation of the corrugated-board industry. With the increasing use of the combine, this supply of straw is fast disappearing. This calls for new and cheaper methods of concentrating valuable products now left scattered over fields. The one-man pickup baler will play an important part. An attachment to corn pickers that will also cut, bundle, and tie the stalks would make our cornfields the source of commercial cellulose for paper making. Research is being carried on in cutting the entire cotton plant and harvesting it along with the lint and seed. The whole product is run through stationary plants where, by separation and solvent processes, the desirable end products are obtained. The stalk is principally cellulose and the lint is pure cellulose. If the world demands synthetic fibers, perhaps we should grow the source material annually. Some day we will cut our last virgin forest.

Today there are companies and individuals who make a business of concentrating agricultural products at mills and factories for industrial processing. The mixing and

composting on the farm of stalks, straw, weeds, grass, and leaves with mineral fertilizers will be of increasing value. We may well ask ourselves why we should not operate our own fertilizer plants. One of the answers will be found in a low-cost efficient way for concentrating widely spread low-valued and waste farm products.

X. *Construction*

Farm and community workshops, where lumber and the products from home-grown tree crops can be turned into useful farm equipment, are certain to be a part of vertical farm diversification. Trees are a crop that should be harvested when mature and their products made by farmers into farmyard furniture.

This industry lends itself admirably to balancing summer and winter work periods. Trees are cut and logs sawed when weather is too severe for other outside work. Lumber can be cured during the summer and worked up in warm buildings during the winter. A farmer need not hesitate about going into this business simply because he does not have sufficient trees of desirable species on his own land. Most prefabricated units are built by those who buy their lumber wholesale in carload lots.

The degree to which farmers use their otherwise idle time for making useful farm tools and equipment represents some income as against none. The increasing emphasis on erection and the reworking of farm buildings from the standpoint of their economic use makes this field of particular value. Many farm tools have been built to save the field labor of the farmer. Little has been done to save

his farmstead labor where he spends about half of his time. Buildings may become tools when properly constructed and used. This idea is just beginning to take hold. One phase of it will be to have movable equipment such as hog troughs and smaller items that can be set into a building and changed around just as house furniture is moved in the various rooms of a home. Small buildings such as brooders, hog houses, smokehouses, and grain bins can also be made. The degree to which the products are refined, that is, whether farmyard furniture or home furniture is made, can be determined by the skill of the operator and the outlet for the products. Wood is available everywhere. Wood products are universally used. Every farmer has some knack for making things out of wood.

XI. *Measuring Devices*

With the coming of vertical farm diversification, plants which process farm products must be in a position to measure their products accurately. This will call for the manufacturing of a relatively wide range of measuring equipment which will reflect moisture content, density, porosity, size, tensile strength, concentration, and other measurable factors. Someone should be ready to supply these needed measuring instruments adapted to community processing.

12. Vertical Farm Diversification and Chemurgy

Farm chemurgy had its official beginning in 1935 at Dearborn, Michigan, in a meeting sponsored by Henry Ford. Many persons have made important contributions to its concept, growth, and development. One of the first books that prompted thinking along chemurgic lines was Wheeler McMillen's *Too Many Farmers.*[1] Not only did he stimulate thinking, but throughout the years he has hung on to the idea with bulldog tenacity. He has been president of the National Farm Chemurgic Council since 1937. When others faltered, he has increased his efforts. Many have made their brief contributions, but no one has worked harder and longer than Mr. McMillen. His latest contribution is his new book, *New Riches from the Soil.* It spells out good science, good industry, good agriculture, good economics, and, in addition, it is fascinating reading. It is written by a man who knows—a pioneer thinker.

Chemurgists feel that the concept of chemurgy is one answer to the burdensome farm-surplus problem. It recognizes the fact that the human stomach is relatively inelastic. Hence, when farmers produce large crops, there is not a

[1] New York, William Morrow and Company, 1929.

corresponding capacity for its consumption. Further, the eating habits of the American people change from period to period. Specialty food producers often find that their market is slipping away from them, for that one reason alone. For example, we are eating about 25 per cent fewer potatoes and less grain per capita than we did thirty years ago and 40 per cent more fruit and vegetables.

The mow of industry is never filled. The limit of industrial taking is one of ability to buy. If the pocketbook permitted, the single-car garage could be enlarged for two cars. In many homes there are a number of radios—one for the living room, the bedroom, the kitchen, and the car. What woman ever had too many compacts or handbags; or what pipe smoker, too many pipes? From this it is reasoned that if the farmer could turn part of his production from food to industrial products, he would thus have not only a new customer, but one that was noncompetitive with his old exclusive food customer.

Chemurgy said, Let's direct some of the unwanted annually produced food crops into industrial products. This called for the aid of the scientist, who would show how milk and soybeans could be made into fibers and plastics, sweet potatoes into adhesives, castor beans into paper and airplane-engine lubricants, and corn into liquid fuel for driving engines. Thus farmers who represented producers, scientists who charted the course, and manufacturers who made and sold the products were called together to aid in working out the problem. Today scores of successful chemurgic enterprises are evidence of the soundness of the concept.

Chemurgy can and does play an important role in vertical farm diversification. It starts with the annually produced crop, a renewable resource, and creates the base for continuing supply. Not so with processing plants using nonreplaceable resources such as oil or coal that are limited in extent and demand relocation or abandonment of plant when specific quantities in particular areas are exhausted. For the farmer who wishes to follow his raw products beyond raw production, there is an equal opportunity to turn toward industrial products as well as those that are eaten and worn.

There are but four, perhaps five, main crops from the standpoint of chemurgy. They are:

Protein—found in greatest quantities in such crops as soybeans, cottonseed, flax, alfalfa, and other legumes.

Starch (Sugar)—most abundant in sweet and white potatoes and other tubers, corn, some other grains, sorghums, and similar crops.

Oil—generally associated with high-protein crops such as beans and cottonseed, castor beans, flax, peanuts, tung, and some tropical plants.

Cellulose—found in purest form in the lint of cotton but also abundant in trees, and the stalks and stems of most all plants. Lignin, generally associated with cellulose as the binder holding the fibers together, may be considered chemurgy's fifth crop.

When the farmer looks to his new chemurgic-industrial customer and inquires about specifications for the products he wants, he finds that they are vastly different from those

set forth by his food customer. At once the troublesome grading problems that relate to flavor, size, odor, color, and condition pass into a secondary position or are entirely out.

A good example is found in sweet potatoes. The grower who produces for the food market may not be able to sell more than half of his total yield. Some potatoes are too large or too small, misshapen, bruised, sunburned, slightly decayed, and others have failed to cure satisfactorily in the drying house. When the starch manufacturer becomes the purchaser, these grade standards are abandoned and he buys on the basis of total pounds of starch content.

Let us illustrate the point in this manner:

	Bushels Potatoes per Acre	*Per cent Starch*	*Pounds of Starch to Sell*
Farmer A	100	15	900
Farmer B	100	30	1800
Farmer C	300	15	2700
Farmer D	300	30	5400

Note that *B* has twice as much product to sell as *A*, although their yields of potatoes are the same and each has the same volume to handle. *D* increases his yield of potatoes over *A*, three times, but, by using a variety higher in starch content, he has six times as much starch to sell. Or, stating it in another way, we may say that when growing for the industrial market, volume of salable product may be doubled even though yields remain the same, but when both yield and content are brought to high standards, the volume of salable product may be increased six times.

Chemurgic industries will accept:

1. Varieties that yield most pounds per acre regardless of grade requirements, affecting hard-to-control characters such as color, flavor, size, and shape.

2. Minor damage and defects.

3. All of the production.

When producing for the industrial market, growing and handling costs are generally less because less care is needed, and bulk and machine methods can be employed rather than hand methods. Portions of crops slightly damaged by weather or handling, thus creating the low grades of the food market, can be sold to the industrial market. Frequently ability to hold off the market only 5 or 10 per cent of the low end of a crop will stabilize the price on the remaining 90 to 95 per cent. Industry affords a market for portions inevitably wasted when the food market constitutes the only outlet. This point has been abundantly demonstrated in the Idaho potato area, where recently constructed starch plants now afford a market for that portion of the crop that does not move into the edible market profitably. Thus the problem of forcing more and more potatoes on an overstocked market, which always ruins the price, is eliminated. As long as consumers will take potatoes at a fair price, they are shipped; but when prices begin to fall, they are diverted to the factory. This stabilizing influence on market price is of untold value to the whole market. Ordinarily it is necessary to process but a small part of a total crop to stabilize the whole. Only about 15 per cent of a normal corn crop is industrially marketed, but this minor portion sets the price on all corn. The producer

of raw farm products, who contemplates carrying them beyond raw production, should study and be familiar with all alternate routes as a means of stabilizing the market.

When food markets appear to be overstocked, as evidenced by low prices and critical buyers, it is sometimes possible to turn a product from its usual channel into an industrial outlet without any major changes in handling procedure.

In alfalfa regions the grower can make hay for his own feeding or sell the surplus in the field to a dehydrating company that makes it into meal for Eastern chicken raisers. The grower of wheat or oats can cut the crop when four to six inches high, take it to a dehydrator, and there have it turned into pills for human consumption, or let the crop mature and sell the grain for breakfast food or flour.

Alternate routes are important. The one-route, one-outlet crop is the most hazardous. Careful planning to get many choices of outlet and sales competition, is profitable planning. This applies equally well to the raw product as to the one that is taken a few steps beyond production by the grower-processor.

In chemurgy the farmer has enlisted the aid of, and in a manner become a partner with, two important groups—the scientist and the industrialist. When I began a cotton-breeding program to develop a type of lint that would best meet the needs of tire manufacturers, it at once became clear that not much progress could be made until I could meet the persons who tested and used it. When I finally sat across the table from officials of the rubber company, the head of the research department said: "I have been with

this company for twenty years. I have studied, tested, and worked with every type of cotton this and foreign countries can produce, hoping to find a better one for tire cords. During all these years you are the first cotton producer who ever came into this office to talk with us about a better cotton for tires."

As progress is made in production for chemurgic uses, producers will find it increasingly necessary to meet their actual and potential customers. Not until each tells the other how products can be changed and modified, can real progress be made. Users must know how some of their requirements hurt or help producers, and producers must hear from those who have a genuine interest in the business how they can modify their products to better fit the needs of the processor and manufacturer.

Often slight changes which cost little or nothing will make many dollars of difference in the end product. I recall the practice we had of sunning the cotton in the field during the day it was picked. Instead of having the pickers dump their sacks directly into the cotton houses, we had them spread the cotton out on tarpaulins where it could be sunned throughout the day. As a result it was whiter and dryer. Whiteness tended to raise the price, but sunning tended to weaken the fibers. Thus the producer received, and the consumer paid more, for a product that was of less value to the user. It was only when seller and buyer talked this problem over together that the practice was changed.

What is the net gain from filling livestock with water just before they are weighed? There are hosts of practices

that could and would be changed and problems solved if producers, researchers, and industrialists sat down together and talked over their problems. Perhaps one of them would be the elimination of some of the multitude of in-between operations.

This brief excursion into chemurgy should give vertical farm diversification operators a view of the dual roads which their products may travel. The route of the consumers of edible products is old and well understood, save for new applications which are constantly appearing. The route which ends at the receiving dock of the industrialist is not so well defined or understood. It will be more heavily traveled when it is better understood. Anyone contemplating steps beyond production should study both outlets before selecting the one best suited to his needs. Chemurgy and processing for human consumption are both new and their study will richly reward the student of their potentialities.

13. Vertical Citrus Diversification

CITRUS, a perishable crop, has had its full share of ups and downs. Pioneers tell of the sale of an entire forty-acre crop of grapefruit which brought $124. Others tell of crops that none of the brokers would buy at any price. One grower who shipped his crop direct got back a bill for $89.75 for freight in excess of the price of the citrus. Most producers who were in business prior to 1935 can tell similar stories. It was in desperation that they began organizing co-operative marketing associations in the early thirties. It has taken many years to work the kinks out of what was a basic and sound concept. They have learned by trial and error, and paid dearly for the know-how of co-operation.

It was not long until the officials of the associations, which at first performed only packing and marketing functions, saw that individual growers could not succeed unless they produced as well as marketed efficiently. Further, the associations could market no better fruit than they themselves, the growers, produced.

Citrus for the most part is grown on small units of twenty to eighty acres with an average of about thirty acres.

Many of the groves are owned by absentee landlords who live in the North. Some had been sold their little units by promoters at fantastic figures. The sellers agreed to clear the land, set the trees, and care for the groves for three years. From then on the owner was on his own with a continuing annual charge for irrigation, tree care, and cultivation, of from $50 to $100 an acre per year. Of course, with a young grove there was no chance to make a profit, so the clerk in Philadelphia or the school teacher in St. Paul who had dreamed of twenty acres and independence in the sunny South was faced with losing a life's savings.

To meet this crisis and other problems, the officials of the co-operatives proposed to add grove-management service as a separate division to the packing association activities. Whether members availed themselves of the service was optional. A grower who lived the year round in the Rio Grande Valley, for example, generally felt he could handle his grove, but for the nonresident the assumption of management responsibility by an organization was indeed a welcome relief.

Now a third problem arose. Not all fruit that grows, even in the best-managed orchards, can be packed in boxes and sold as fresh fruit. Years when fresh-fruit markets were slow with a heavy percentage of small fruit or hail or frost damage, the grower found that 50 per cent of his crop was not marketable as fresh fruit. Further, many of the early grapefruit varieties had an excess of seeds. When the seedless varieties and later the pinks, and still later the blood reds, came along, the old seedy varieties were almost unsalable as fresh fruit. With heavy percentages of low grades,

the price of the high grades was correspondingly pulled down. Here was the old grade problem bobbing up again. The old-time Valley growers will tell you today that they have never produced truly superior fruit to the old Duncan, which was heavy with seed. However, housewives of the North discriminated against it, and I remember the winter when I was in the Valley and saw as fine grapefruit as was ever produced going begging at $4.00 a ton, 16 cents a box, or less than 3 cents a dozen.

Here was another crisis that only the grower himself could surmount. What could he do with his seedy grapefruit or those that were too large, too small, or had slight damage? This brought the Río Grande Valley Citrus Exchange into being in 1932. It was a co-operative created by other co-operatives. The Exchange was to do two things—sell fresh fruit for the local associations and begin the canning of grapefruit juice from the off grades of the associations.

With one selling organization representing eleven associations, the market could be stabilized. What had been the bidding of one selling group against another would be stopped. The Exchange adopted one brand name for all its juice products—Texsun. Later it changed its name to the Texsun Citrus Exchange. It handles over 40 per cent of the Valley's production. Gross annual sales amount to about twenty million dollars. It has no debts.

One of its affiliates, the Citrus Supply Corporation, owns timber acreage, a sawmill, and a box factory. The box plant turns out about five million boxes a year for the member growers. It is also the purchasing agency for fertilizer and

spray materials, and any other supplies regularly used by the Exchange or the member associations.

Now the circuit seems complete.

To get the whole story and see just how these co-operatives work, let's start back out in the country where a group of growers have gathered to discuss citrus production and marketing problems.

Mr. *A* says he has been selling to local brokers who buy on the tree. Comparing his returns with what members of an association have told him they get, he sees that he is not receiving as much as they do. He states that he tried to join an association, but it already had all the members its facilities could handle. The Exchange will admit a new member association, he says, so he proposes that he and others make up an association of their own.

Mr. *B*, who reminds his neighbors that he is not a resident of the Valley, feels that his problem is better grove management. If the new association would put in a department for grove management, he would be glad to join.

Mr. *C* says that, in his opinion, it is the juice fruit that makes the real trouble, and, if he could be assured that if they organized a new association they would be taken in by Texsun Citrus Exchange, he would go along.

They count up acres and find that they have a total of 1,000 and each one knows of others who should join later. It looks as though they could get an acreage of about 2,500 to 3,000, which would be a good start. They form the association and apply to the Bank for Co-operatives for a loan for enough to build a packing house and get started. They elect officers, hire a manager, and authorize him to

employ personnel qualified to operate and manage orchards. Thus the Pleasant Valley Citrus Association is born and goes to work. Those who want orchard management turn their groves over to the grove manager, who assumes full responsibility for all phases of operation of individual groves. He pays the water bill, buys the fertilizer and applies it, does the pruning, and buys enough machinery to operate all the groves under his management. No owner with a twenty- to forty-acre orchard could afford a full line of tractors and equipment, but, with this co-operative plan, the machinery is kept busy. Purchasing fertilizers and spray materials in quantity through the Citrus Supply Corporation reduces the cost, some associations say as much as 50 per cent.

The fruit is now ripe, and the grove management-year has come to a close. The manager makes a report to Mr. *B,* who was the first to sign up. On his final statement every item is charged on the basis of actual cost and a prorate of cost of services rendered. This means that the little ten-acre man pays on exactly the same basis as the largest grower. The association manager or his representatives have been visiting the groves during the summer and reporting their condition to the owner. He has also tabulated estimates of average yields of oranges and grapefruit by varieties.

Now the fruit is ready for picking and packing. The manager of the Exchange calls up the associations saying he has orders for five cars of Hamlin oranges and ten of Marsh Seedless grapefruit. The Association sends trucks and picking crews to the orchards having the most ripe

fruit of the varieties desired. The picking and hauling are done by contract. Soon the fruit begins to roll. As each load comes in to the packing shed, it is weighed and credited to the proper grove owner, where a further adjusted credit is made after the fruit is graded and packed. It shows that the fruit from one grove had 75 per cent firsts, 15 per cent seconds, and 10 per cent juice. When a car is loaded, the Exchange gives billing instructions, and from then on it is handled by the Exchange, which makes the sale and remits to the association the full price less estimated cost of operation. When the check comes in, each grower who had fruit in the car is credited with his proper share.

It is noted that the association gathers the fruit, grades, adds color if necessary, stamps the brand name, "Texsun," on each individual piece of fruit, and loads the car. In its own truck it hauls the juice fruit to the headquarters plant of the Exchange. This is a simple, direct, and important service. Each association wants its fruit to grade out as high as possible so as to make the best possible returns to the member grove owners, but at the same time it must protect its name and thus no overgrading is tolerated. This makes two checks—one tends to raise; one, to hold down. Both are self-imposed, self-regulating, and fair to all concerned. After all, the owners of the association are the grove owners themselves. Their returns can only be the net returns at the end of the year.

We have noted that the Texsun Exchange handles the sale of each car of fresh fruit. Eleven associations turned their packs over to the Exchange and in the 1945–46 season

that meant 10,585 cars or 5,275,082 individual packages, boxes, or baskets. This represents a growth of over 4,000 cars in the last three years. The Exchange has representatives on some of the larger markets, and thus the growers' interests are protected to the final sale and delivery of each car. This handling of all sales through one organization, instead of eleven, as was formerly done, is one of the major factors in preventing market gluts and severe price slumps. No one factor has been of more importance in getting uniformally fair prices through the seasons, and preventing cutthroat competition and waste from shipments that are discounted or refused.

The Exchange performs another important function, namely, the turning of the low-grade fruit into juice. As each association grades out its box fruit, it has a percentage unacceptable for box packing. This is taken to the one big juice plant of the Exchange and made into canned grapefruit juice. The price on the juice is fairly stable, so that each association can take the pressure off the fresh market by sending more to the juice plant whenever necessary or desirable. Hence, if the fresh market falls too far, the cure is found in heavier canning. The juice is mainly marketed in the summer after most of the fresh fruit has been sold. This levels out the marketing over twelve months instead of seven as formerly.

One of the problems of the Exchange was the disposal of the peel, rag, and seed left after the juice was extracted from the whole fruit. The accepted method was to haul it out on fields and bury it. Places where this could be done were becoming scarce and the procedure was expensive.

Out of this problem grew the now well-established plan of grinding and dehydrating this waste material. It is put up in 100-pound bags and sells on the basis of its feeding value. The analysis shows:

Crude protein	5.5 per cent
Nitrogen free extract	62.0 per cent
Crude fat	2.5 per cent
Crude fiber	10.5 per cent

The income to the Exchange was $350,000 in 1945–46 for about 12,500 tons of the dried feed. It sold in 1946 for about $40 a ton. It is used by commercial feed companies, who put it into some of their mixed feeds, and by livestock men who feed it direct. Dairymen are finding it of particular value. It is produced in a feed-deficient area and hence has an excellent freight advantage as far as local uses are concerned. During the war, shortages of feed created a demand for it as far north as New Hampshire. The growth of this business is shown by a comparison of the tonnage produced in 1939–40—692 tons—and in 1945–46—12,500 tons.

The wet ground peel is held in large bins from which a certain volume of liquid drains by gravity. This material is then processed into a molasses which may be sold as such or converted into alcohol. From the peel, prior to grinding, citric acid is obtained which makes five marketable products, all but one of which, fresh fruit, was considered waste before the days of juice canning started some ten or twelve years ago.

It will be noted that there is one primary difference between the operations of a co-operative and a commercial

juice company. The latter buys its raw product, the fruit to be juiced, at a fixed price per ton. To this are added processing and sale costs. In contrast, the Exchange gets its fruit at no cost. It processes it into juice and by-products, sells all the products from which direct operating costs are deducted and the difference is prorated among the growers who furnished the original fruit.

To the grower, the price he receives is the dollars per ton or per box he gets for the fruit sent to the Exchange. It is a patronage dividend to its member owners. Both are equally anxious to have the final ton price as large as possible, in contrast to the cash buyer who normally buys as low as possible.

This story of the Valley citrus growers applying the principles of vertical farm diversification to their main crop, citrus, is an excellent example of what can be done in carrying a raw product many steps beyond raw production. When the Valley sold only fresh fruit to shippers and brokers, the whole area was in a chaotic condition. Producing was unprofitable, and land values had slipped out from under grove owners. Acreage that cost $1,000 when it was five years from production was selling for $300 while in full bearing.

Florida citrus growers have also effectively applied vertical farm diversification above and below the line of production. They have worked out co-operative grove care in such a way that its cost has been almost free. It has been lowered by virtue of getting fertilizer and spray materials at wholesale, by using large and efficient equipment, and by reducing volume of labor used. Yields have been stepped up ma-

terially, and, when the effect of both are realized, the net effect is that the superior management has just about paid for itself.

The growers have found that they can perform for themselves more and more of the services others formerly performed. The list is about as follows:

Service Rendered	*Formerly Performed by*	*Now Performed by*
Handling fertilizer and spray material	Local retailers	Growers
Management of groves	Local managers	Growers
Picking and hauling	Local contractors	Growers
Grading, packing, coloring, and waxing	Local buyers	Growers
Precooling	Local plants	Growers
Hauling and icing	Railroads	Railroads and grower trucks
Advertising and promoting	Outside firms	Growers
Wholesale handling	City brokers	Growers and brokers
Retail selling	Grocery and fruit stores	Grocery and fruit stores
Financing	Banks and special loan companies	Government co-ops
Juicing	Local independents	Growers
Peel and rag disposal	Waste	Growers sell feed
Other by-products	Waste	Growers save and sell
Boxes—baskets	Box companies	Growers

This list shows the progress that has been made by a group of producers who formerly had very little in com-

mon, but now co-operate fully in carrying their products from production to final distribution. There is probably no better illustration of complete vertical farm diversification in the United States than that which has been worked out by citrus growers from California to Florida.

Has it paid? The best answer is found in the steady increase of citrus groves, the rapid growth of co-operatives, and the increasing responsibilities they are assuming for their members—the growers. The manager of a large and complete co-operative said that what was formerly waste just about pays their plant operating costs.

These citrus growers have applied one essential principle to their operations that should permanently eliminate one of their greatest problems. When independent producers sell perishable products in competition with each other, there is no way of avoiding extremes in market prices during the marketing period. Those who happen to market on a slump may, and often do, face complete disaster. The forcing of an entire crop on one type of market, the fresh market, results in market demoralization by perhaps not more than 5 per cent to 10 per cent of the low end of the entire crop. The installation of the juicing plants and centralized selling have solved the biggest difficulty in marketing perishables. Each association gets daily instructions where fresh fruit is to be billed, and the volume to be sent to the cannery. The first prevents market gluts on individual markets, and the second avoids forcing a volume on the total market that it cannot absorb. Control starts with instruction to picking crews. They bring to the sheds only that fruit for which there is the best demand. Sorting

in the shed determines the proportion going to the juice plant and the fresh market. When the fresh market begins to sag, volume to juice plants goes up. Management knows about how the canned product works out in regard to value, so, in effect, the juice-plant manager stands by with a constant minimum bid. In effect he says, "If the fresh market won't pay a given price, I will and I will take any volume you send me."

Of late years, strawberry and other similar growers have found that the freezing plants play the same role. The housewife who formerly waited for the flush-season low-price period finds that it never comes. The freezers agree to take all berries, let's say at 25 cents a quart. Higher prices send the fresh fruit to the markets; lower prices result in diversion to the freezing plants.

There is no principle in marketing that has a greater effect on stabilization. It can be applied to practically all farm products. The alcohol plants could apply it to corn, wheat, and sorghum; the starch plants, to potatoes and some grains; and the dog-food makers, to meat animals. When the producers and processors are separate groups, it is hard to make the principle work. The growers must control both. These processing plants would be worth their cost, simply as stand-by services in large volume areas. There is a limit to length of storage for fresh products, but processing, canning, freezing, and drying, in most instances, extend safe storage periods materially. When the products are once in processed form, their full effect as a weight over the market is reduced or eliminated. This is in contrast to the ever normal granary idea. It will be quite

difficult to make this plan fully effective without having it hang as a bear influence on current markets.

As individual farmers and co-operating groups extend their vertical farm diversification plans, they will become increasingly conscious of the value of the basic principles just discussed. In my opinion, there are none more vital to a future stabilized farm market throughout the entire nation.

Courtesy Production and Marketing Administration
U. S. Department of Agriculture

Sacking sweet-potato starch

14. Vertical Farm Diversification in Action

IN 1924 we became the managers of cotton plantations ranging in size from 7,000 to 13,000 acres. Rex R. Bailey, one of my associates, managed a large unit, and I assumed responsibility for a smaller one. When the work was started on the smaller unit, the plantation was concentrating almost exclusively on one product—cotton. Yields were near one-half bale to the acre—267 pounds in 1926—and operations had not been profitable. There were a store, an office building, and a gin on the plantation. About 3,000 acres of cotton were grown, with the remaining cleared acres devoted to feed crops for mules, the only power, and a small area to green-manure crops. About 150 share-cropper families, roughly 500 persons, most of them Negroes, lived on the property. The annual budget was from $100,000 to $150,000.

The operation of this property will be described from the standpoint of its vertical diversification and the results obtained. No attempt will be made to give a complete farm-management picture. Production operations are mentioned

only as they played a part in the vertical diversification program.

The start was made during the year of the big flood, 1927. As records accumulated, three things became clear: (a) Gin operations were profitable even during years when production showed a loss; (b) cottonseed sold as ginned went to market at the lowest price period of the year; and (c) there was no way to make a profit from growing cotton when the yield was no more than one-half bale per acre.

These were not random observations. Gin operating results were taken from the auditor's reports. The price of cottonseed was determined from a study of cottonseed statistics. The share-cropper got half of the crop for his labor. Fertilizer and weevil control cost from $4.00 to $6.00 an acre, and the cost of mule power, tools, supervision, overhead, and land rent had to be paid from the remaining half, or 125 pounds of lint to the acre. Many studies have shown the per pound cost of growing cotton at low yield levels as being prohibitive. (See Table 4.)

A top price of 20 cents a pound for lint was realized in 1927. Then the price steadily declined for the next four years to 6 cents a pound. It was notable, however, that competition in production was as keen at 6 cents a pound as at 20 cents. Indeed, it is a well-known fact among producers of raw farm products that price has little to do with efforts to produce a big yield.

It was clearly evident that production had to be increased, costs lowered, and other sources of income found. History and experience had demonstrated that cotton was

the most profitable crop for the cotton belt. This meant that intensification of operation should center on cotton. Higher yields were achieved in this manner.

Early suggestions for combating the boll weevil had recommended chopping cotton to a thin stand. This lowered yield. We began telling tenants to leave thicker stands, but with indifferent results. We then put on a "stand" contest, offering modest awards for stands that were most nearly correct—about two to three plants every hoe width. Each crop was inspected by the management, and awards were given with appropriate ceremonies. That solved the stand problem.

TABLE 4

Cost of Growing Cotton at Different Yield Levels

OKLAHOMA[1]		MISSOURI[2]	
Yield of Lint per Acre	*Cost per lb.*	*Yield of Lint per Acre*	*Cost per lb.*
50	1.22	250–324	0.082
100	0.21	325–399	0.075
150	0.18	400–474	0.065
200	0.15	475–549	0.057
250	0.13	550–624	0.050
300	0.11	625–699	0.049
350	0.10	700–774	0.039
400	0.10	775 or more	0.041
450	0.08		

1 "Influence of Yield on Costs and Income in Agricultural Production," University of Missouri, College of Agriculture, *Agricultural Experiment Station Bulletin No.* 297 (March, 1931). Taken from a paper by P. H. Stephens of the Oklahoma Agricultural and Mechanical College before the national meeting of the Farm Economics Association at Cleveland, Ohio, in 1930.

2 "Cost of Producing Cotton in Southeast Missouri; 1941," University of Missouri, College of Agriculture, *Agricultural Experiment Station Bulletin* No. 467 (April, 1943).

TABLE 5

Yield of Lint per Acre and Gin Price of Cotton

Year	Yield of Lint per Acre—Pounds	Average Price per Pound
1926	267	$0.200
1927	313	0.185
1928	337	0.145
1929	370	0.100
1930	244	0.065
1931	311	0.070
1932	247	0.120
1933	396	
1934	407	
1935	439	
1936	481	
1937	667	

A series of cotton-variety tests were started, in which the variety best adapted to the property was determined and used.

In co-operation with the Mississippi State College Delta Experiment Station, a fertilizer test was located on the property. Out of this came the fertilizer program which not only showed the best kind and proper amount, but also the kind that gave the highest yield for each dollar of fertilizer investment.

We were purchasing a number of cars of fertilizer each year. Neighbors bought small lots from us. As a result, we established a dealer relationship with the manufacturers so that we received the usual margin between wholesaler and retailer. The same practice was applied to other plantation supplies.

As yields increased, neighbors wanted our cottonseed, and we found it relatively easy to build up a substantial local business in cotton planting-seed.

When winter legumes began taking the place of nitrogen fertilizers, we again reduced fertilizer costs and opened a new field for the local sale of legume seed.

Our tenants required financing from the first of the year until cotton income started in September. Therefore, we inaugurated a bank operation through which we loaned them the money to buy their groceries and clothes. Later we opened a store and put in a stock of quick-turning goods and groceries. Being fully aware of the possible evils as well as the advantages of company-operated stores, we made no demands on our tenants to buy from the store, nor did we issue scrip or coupons for use there. And we were careful to hold prices as low as possible and still keep our operation on the profit side of the ledger. Thus, although tenants were not required to buy at the store, because of its proximity and fair prices, most of them did.

Hogs were kept in the mule lots to clean up waste. Tenants purchased large quantities of "side meat." We began growing and butchering our fat hogs, and selling the meat at retail. As this was not profitable some years, we enlarged or decreased volume in accordance with demand and margins. A post office located in the store brought the usual rent income.

Better medical service at less cost to tenants was made possible through a contract with one doctor, whose fees were fixed and payment guaranteed by the plantation. No profit was made on medical, hospital, or burial expenses.

In 1937 the yield of cotton was 667 pounds of lint per acre, and it has since remained above a bale per acre. Growing costs have been materially lowered per pound and per acre. As tractors came into use, the number of mules was reduced, further lowering costs. Before this change was made, the facts were first determined.

Direct tractor costs (two-bottom-plow units) ran from 40 to 46 cents an hour. Twelve tractors averaged 1,270 hours of work each per year. A two-bottom-plow–size tractor took the place of ten mules; and a three-bottom, fourteen mules.

We used the term "one mule-power equivalent" to compare the work a tractor actually accomplished with the same work done by the required number of mules. On that basis it cost us 62 cents a day with a tractor to do what one mule did and 81 cents a day to do the same work with a mule.

Not all of the steps that were taken, however, have been sufficiently described to give a complete picture. Parts of the program were made possible by the fact that a relatively large number of persons lived on the property. A northern corn farm of the same size would not have had more than one-tenth the number of families, and a cattle ranch or wheat farm would have had even fewer. Nevertheless, this operation shows some of the ways additional profits can be made by staying with one crop but developing its related branches *below the line of production*. The old idea that the farmer must buy at retail and sell at wholesale is not necessarily true in all cases.

But there was another, highly important type of diversification to take into account—*vertical diversification above and beyond production.*

Ginning is the first process through which seed cotton goes after it is picked and hauled from the field. Large plantations have their own gins, but small growers take their cotton to a gin where it is handled co-operatively or ginned for a stated price or bought by the gin operator. The ginner quite universally buys the seed.

The old brick gin on the plantation burned in 1936, near the end of the season. Time, therefore, permitted a year of study of the types and makes of gins that had been found to be most successful. The final decision was to purchase an all-metal gin. It was housed in an all-steel building, making it possible to eliminate fire insurance, which is high on gins because of frequent and unavoidable fires. Modern equipment throughout gave these results:

Cleaners raised the grades—result, higher prices for lint.

Dryers made smoother grades of cotton and increased rate of ginning—result, increased price and increased volume ginned.

Newest types of gins produced less waste—result, more pounds of cotton to sell.

Carefully engineered installations—result, lowered power costs.

Modern power units—result, lowered power costs.

Heavier bagging and ties—result, better-looking, more secure bales, and increased number of pounds of jute and iron to sell at the price of cotton.

Half of the cotton and seed belonged to the tenants. Some sold their lint to outside buyers; others preferred to sell to the plantation. On the portion of lint and seed purchased there were the usual brokers' margins.

As new types of gin equipment came on the market and were tested and proved, they were installed in the gin. In this connection something should be said about the fine work being done by Charles A. Bennett, head of the United States Department of Agriculture Gin Laboratory, Stoneville, Mississippi. Mr. Bennett is the originator and developer of gin dryers. He has also perfected a new press for gins which will raise density from eleven pounds, regular gin density, to twenty-two pounds compress density. This will make it possible to ship full cars of baled cotton direct from gin to spinner, thus eliminating present com-

TABLE 6

The Average Price of Commercial Cottonseed per Ton from 1931 to 1940 by Months[1]

September	$20.73	March	$23.49
October	21.60	April	23.84
November	22.56	May	24.18
December	23.03	June	23.73
January	23.00	July	22.08
February	23.26	August	23.87

Average for the active ginning months, September, October and November, $21.00+; for the non-ginning months, $23.00+. The range within single seasons has been: in 1933, $13.00 low, $19.00 high; 1940, $22.00 low, $29.00 high.

[1] From U.S.D.A. *Agricultural Statistics,* 1938, page 115, and 1941, page 146. During the war price of cottonseed was set by the O.P.A.

press charges, which have run from 50 to 60 cents a bale for pressing and about 25 cents a bale monthly for storage. Our costs for these items ran from $1,500 to $2,500 a year. Later we became part-owners of a compress.

Table 6 shows the average price per ton paid for cottonseed by the oil mills to ginners by months from 1931 to 1940 inclusive. It will be noted that the rise from the three lowest months—September, October, and November—to the three highest—April, May, and June—is about 10 per cent. The average difference in price per ton is a little over $2.00. In many individual years the difference was $5.00 to $7.00 a ton. A 3,000-bale crop yields, in round figures, about 1,500 tons of seed. The average gross difference between selling in the fall and in the spring would be $3,000.

In 1937 we built a storage house with 7,440 square feet of floor space and 151,680 cubic feet for .023 cents a cubic foot. The total cost was $3,618.92. The increased price on one seed crop has netted more than the cost of the storage house. Of course, there is a cost to storing, such as shrinkage, bagging, and rehandling, but there has been a net profit every year of operation.

Two other opportunities for obtaining a premium on our cottonseed were developed. A seed breeder offered $10.00 a ton above commercial mill prices for increasing some of his pure strains. Only a portion of the crop was eligible because of certain planting restrictions such as isolation and other factors.

The Minter City Oil Works was organized as a co-operative for handling commercial seed. Members shipped seed to the mill, where it was worked into oil, meal, linters, and

hulls. These products were sold, and the profits were returned to the planters on the basis of the volume of seed furnished. By thus joining with our neighbors, we became oil millers and enjoyed the profits from this enterprise. Over the years our seed-milling operations paid a premium which ran from $5.00 to $8.00 a ton.

Every farmer knows the importance of selecting pure strains of best-adapted varieties for the crops he grows. We felt that in the future increasing emphasis would be placed on high-quality lint, with specific emphasis on those characters most desired by particular groups of users such as tire companies and commercial cloth makers. Up to this time most cotton breeders had set for their primary objective high yield, even though some high-yielding varieties are avoided by certain buyers because of the poor end results obtained at the spindles.

Early in 1936 we held conferences with Mr. R. W. Webb and his associates in the United States Department of Agriculture. We learned of the work they were doing in separating fiber characters and measuring their effects on the finished yarn. Out of this grew our determination to begin a cotton-breeding program with the objective of producing that type of lint which would best fit special uses—tire fabrics for example.

During that summer we employed a young cotton breeder, John W. Oakley, who had just been graduated from the Mississippi Agricultural College. The first objectives were greater tensile strength and finer and more uniform fibers. The details of the beginning of this pro-

gram, new at that time and certainly not a commercial operation, are described in full in another place.[1]

Out of this general breeding program came these results:

The production of special tire lint that increased the fatigue mileage of tires as much as 61 per cent.

Increased in tensile strength of fibers from 75,000 pounds a square inch to 100,000 pounds.

The production of fibers as fine as imported Egyptian cotton and with much more uniformity.

This lint, when available in volume, was sold at a premium to tire manufacturers. We were able to sell our superior seed for $125 to $150 a ton when oil mills were paying $50 a ton or less. Other crops were bred and increased, and the pure seed brought prices above those of the open market. Some other minor crops were developed.

Prior to the beginning of the seed-breeding program, the plantation had joined another co-operative, the Staple Cotton Co-operative Association, of Greenwood, Mississippi. Through it we sold our lint, both commercial and special. This organization, through its experienced and efficient general manager, Mr. William M. Garrard, represented the producers as selling agents. The usual sales commissions, plus good marketing methods, resulted in substantial additional profits which had previously gone to others. It was just one more step up and along the route to vertical farm diversification. This same co-operative later became

[1] See J. D. Ratcliff, "New Crown for King Cotton," *Collier's* Magazine, Vol. 111 (August 28, 1943), 30.

the furnishers of credit, both production credit and commodity loans on cotton, the insurers of cotton, and the purchasers of fertilizer and insecticides for its members.

An excellent illustration of how producers can profit in unexpected ways when they enter commercial fields beyond raw production is found in the following story. The organizers of a cotton co-operative association settled on a local cotton merchant in a small Mississippi Delta town as the best man to be manager of their new enterprise. They offered him as much as $50,000 a year, and when he refused, saying that he could not afford to give up his own business for that sum, were inclined to look elsewhere. However, after further conversation, a salary somewhat in excess of $50,000 was agreed upon, at that time an extremely high payment for personal services. But time has shown the wisdom of their move. The manager has done a splendid job, has effected many savings that normally do not accrue to the cotton grower, and has made millions of dollars for the members of the co-operative.

As examples, two substantial savings under his management have been the items of "Loose" and "Gain in Weight," which had never before accrued to the grower who sold his cotton to an independent buyer. "Gain in Weight" is the difference between the original warehouse weight, on which cotton is normally sold by the producer, and the final receiving weight at the domestic or foreign mill. When a shipper or the association, as in this case, sells cotton to a mill, the mill receiving weight is the final basis for settlement. As all cotton shipped abroad is water-borne and much of the domestic cotton shipped to New England

is water-borne coastwise, there is in many instances a gain in weight, caused by absorption of moisture. "Loose" cotton is the residue from samples that are used for classing and later used as a basis for shipping cotton to mills. These samples are baled and sold as "Loose."

It is evident without further explanation that revenue from "Gain in Weight" and sales of "Loose" represents a distinct profit for members of the association. In fact, these two items alone have been more than sufficient to pay the manager's salary, as well as the salaries of all other executive officers, during the quarter of a century this particular co-operative has been in operation.

As hybrid seed corn moved south, the plantation became an associate grower for Funks G. Hybrids. Mr. J. R. Holbert directed the special breeding program that has resulted in adapted strains that have met southern conditions. The growing, storing, drying, grading, bagging, and sale of special southern hybrids soon became a substantial part of the plantation's seed-breeding and sales program. Hybrid corn is taking hold rapidly. It is making a place for itself in the Delta and Hills, and yields per acre equally as good as some of those in the corn belt area are being obtained.

Perhaps the best way to show the various steps that were taken on the Bobshaw Chemurgic Plantation in vertical farm diversification would be to list them in the order of their development. (Begin reading at "Completed Raw Production" and read up for the steps above and beyond raw production and down for those that are a part of production or prior to it.)

17. Organized and operated a seed-selling organization.
16. Processed hybrid seed corn.
15. Became an associate hybrid-seed-corn grower.
14. Bred and developed other types of seed (oats, beans).
13. Stored lint in a jointly owned compress.
12. Sold special types of lint to selected users (tire companies).
11. Contracted with neighbors for producing special lint.
10. Delinted and treated cotton planting-seed.
9. Established seed-breeding department.
8. Sold commercial seed through a co-operative mill.
7. Increased planting-seed for a neighboring breeder.
6. Brokered seed bought from tenants and neighbors.
5. Stored cottonseed.
4. Brokered cotton bought from tenants.
3. Sold lint through a co-op.
2. Insured lint through a co-op.
1. Operated gin for own and neighbors' cotton.

Vertical Diversification Above and Beyond Raw Production.

COMPLETED RAW PRODUCTION

Vertical Diversification Below and Associated with Production.

1. Purchased fertilizer at wholesale for use and to sell at retail.
2. Bought insecticides and other products wholesale for use and resale.
3. Grew nitrogen in winter cover crops.
4. Ran sawmill and maintained carpenter crew.
5. Operated a bank.
6. Operated a store.
7. Ran machine, blacksmith, and welding shops.
8. Produced, butchered, and retailed pork.
9. Leased space to post office.
10. Maintained medical aid and handled drugs.

Some of these activities were possible because of the large size of the plantation and the number of persons living on it. Others were better handled through a co-operative, even though the property was large. Most of them represent types of steps that many farmers can take individually or with others, regardless of size. The list does not exhaust the possibilities. The coming of the cotton picker, improved ginning and cleaning equipment, high-density gin presses, and solvent methods for oil extraction will result in revolutionary changes in cotton belt procedures. They must be accepted by the area if it is to survive. It is my opinion that Mid-South cotton must be grown for 10 to 12 cents a pound if it is to hold its place in the fierce fight of fibers of the future.

For example, only as short a time ago as the early nineteen forties, cotton supplied about 90 per cent of all fibers used in tires. In 1949 cotton had only 37 per cent of this market, other fibers, principally rayon, 63 per cent. This means that other, new uses for cotton must be discovered and developed. This, in fact, is one of the challenging requirements of all diversification—that it assist in making new discoveries which result in improved manufactured products and that it help find better, more stable markets for all products of the farm.

15. And Finally

IS VERTICAL FARM DIVERSIFICATION anything more than an idea or method for creating another job for farmers who practice it?

The answer of those of us who have spent some years in studying and practicing it is "Yes—much more."

Avoiding details, let us look at three important reasons for this answer:

First, vertical farm diversification will improve the financial position of farmers. It will add to their income without restricting production or increasing prices. It operates within the traditional free economy that has made the United States what it is today. It calls for no subsidy, no bureaucratic direction or restriction and fits into the established patterns of competitive American business. It will lift the farmer from that segment of our economy that is paid the least for human effort up into the industrial economy which works within wider margins of profits and greater security. It is a direct frontal attack on the problem of inadequate economic security for American farmers.

Second, vertical farm diversification will shorten and

make more efficient that segment of our economy which is now farthest out of line—distribution. The potential production of our land and the potential consumption of our people are such that we should never have so-called agricultural surpluses. The creation of the farm plan in the early thirties, plow-up campaigns, payments for nonproduction, and subsidies for production all stem from what has been called too much of everything except consumption. There is unlimited evidence to show that our farmers would have to produce to capacity at all times to provide all our people with permanently adequate diets. Efficient raw production and enough processing and servicing, but no more than is actually needed, would strike at the very heart of the imbalance now existing between production, distribution, and consumption.

The third, and by far the most important facet of vertical farm diversification, is eloquently but briefly stated by my beloved former teacher, now dean emeritus of the College of Agriculture of the University of Missouri, M. F. Miller:

"In speaking of farm people as the stabilizing element in our population there is some cause for concern as the per cent of the population on farms continues to decline. As you well know, when our democracy was founded, the population was almost entirely rural. As a matter of fact, American democracy was born in an agrarian atmosphere. It is in such an atmosphere that democracy thrives. As people concentrate in cities and as higher and higher percentages are dependent on a weekly payroll, the stabili-

ty of the nation is lessened. Such people own little property. They are greatly influenced by changes in economic conditions. With loss of employment, and with increasing hunger during depressions, they are particularly susceptible to the teachings of radicals, often those with foreign doctrines. On the other hand, the majority of farmers are land owners. They believe in private enterprise and personal liberty. They believe in democracy which, it must be remembered, was established on Christian principles. They are conservative and usually well balanced in their judgments. They are truly the people who make for stability in our democratic form of government. This should never be forgotten.

"If we recognize the importance of the farmer in relation to the welfare of the nation, it would also seem important to retain considerable numbers of such people on the land. The numbers are already down to about 18 per cent of the total population and their influence on Congress is coming to be overshadowed by that of labor and industry. It is only through the greatest efforts of their farm organizations that farm people are able to exert significant legislative influence. Should their numbers decline to 10 per cent of the total population, as some are predicting, it may be only through their united control of food production and distribution that they can make their influence felt. Certainly it would be a calamity if our farmers as a class are ever required to resort to such means. . . . The possible decentralization of many of our industries, the development of plants for processing farm products nearer the farms, with a resulting increase in part-time

farmers, may come to be one of the most important factors determining our future welfare."[1]

Expanding use of larger and more efficient tools of production decreases the need for increasing the number of people in agriculture.

The land holds large segments of the population in its viselike grip when the tools of production are hoes and crooked-stick plows. Clearly American farmers have rejected this route.

Decentralization of industry—the moving of the shoe or shirt factory to the small country town—is not a dependable means for holding people on the land.

Only to the degree that agriculture offers farm-reared boys and girls real social and economic advantage will they desire to make it their life work. Their elders use the same measures of desirability in reaching conclusions about where they will cast their lot.

It is within the concept of vertical farm diversification that we find the answer for creating and stabilizing a desirable rural-urban balance. It cannot alone accomplish this ideal. The most that may be said is that it marks one of the paths along which we must travel. It will take many years of actual operation to turn the tide of country-city migration.

However, only those steps taken in the direction of our goal, be they little paces or giant strides, contribute to its attainment.

[1] In a personal communication to the author.

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